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ABSTRACT

Many developing countries are now making substantial gains in developing databases on their education system. This book focuses on strengthening the link between improvements in information with better practice at the school level. It provides a synthesis of lessons learned from recent experience and research in collecting, analyzing, and using information at various levels of the educational system in the context of developing countries. It contains four national case studies (of Chile, Togo, Mauritius, and Haiti) and five issue papers in which specialists consider ways of improving education-information systems that can contribute to enhance quality and efficiency in education. The studies and papers emphasize the human factors and nonmonetary incentives that encourage and sustain information utilization. Finally, agendas for further research and training are proposed as a framework that administrators in other countries can use to evaluate the needs of their information systems. References and tables accompany the chapters. (LMI)

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From data to action: information systems
in educational planning

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From data to action:
information systems in educational planning

Edited by
David W. Chapman
and
Lars O. Mählck

UNESCO: International Institute for Educational Planning

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Preface

Many developing countries are now making substantial gains in developing data bases on their education systems. A considerable amount of attention and resources are being devoted to the design and implementation of education information systems as a means of providing decision-makers with more accurate, relevant and timely information for policy formulation and planning.

While substantial progress has been made in developing these information systems, there is a growing concern that the promise of such systems will not be realized unless more thought is given to ways in which improvements in information can be linked to better practice, particularly practice at the school level, where the real activities of education occur. This linkage represents a major challenge in educational planning and is the principal topic of this volume. It is the result of co-operation between the *International Institute for Educational Planning* (IIEP) and the *Improving the Efficiency of Educational Systems* (IEES) project.

This volume provides a synthesis of lessons learned from recent experience and research in collecting, analyzing and using information at various levels of the educational system in the context of developing countries. It contains four concrete country case studies and four issue papers in which specialists consider ways that improving education information systems can contribute to enhanced quality and efficiency in education. The studies and the papers place emphasis on the human factors and non-monetary incentives that operate to encourage and sustain the utilization of information. Finally, agendas for further research and training are proposed as a framework that officials within each country can use to evaluate the needs of their own information systems.

On behalf of the IIEP, I wish to express my thanks to each author and, of course, to the editors, David W. Chapman and Lars Mählck. Finally, special thanks are due to Douglas M. Windham who launched the idea of this book and who has made valuable contributions throughout its preparation.

Jacques Hallak,
Director, IIEP

February 1993

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About the editors

David W. Chapman is Professor of Education at the State University of New York at Albany where he teaches programme evaluation in the Department of Educational Theory and Practice. He is co-author of *The evaluation of educational efficiency: constraints, issues, and policies* (with Douglas M. Windham, JAI Press, 1990) and co-editor of *International issues in educational productivity* (with Herbert Walberg, JAI Press, 1992) and *Improving educational quality: a global perspective* (with Carol Carrier, Greenwood Press, 1990). His research on educational improvement has appeared in the *American Educational Research Journal*, the *International Journal of Educational Development*, *Educational Evaluation and Policy Analysis*, and the *Comparative Education Review*. In addition to his research and work in educational improvement in the USA, he has worked in technical assistance activities in over 18 developing countries.

Lars O. Mählck is a staff member of the International Institute for Educational Planning in Paris and has been associated with the Institute's research project on *The information base in educational planning and administration*. He directed the research projects on *Educational policy and strategic educational planning* and *The evaluation of teacher-training in Tanzania*. His is co-editor (with Kenneth N. Ross) of *Planning the quality of education* (Pergamon, 1990). He co-directed the project on *Improving educational quality through better use of information*, on which this volume is based. In addition to his research activities at the IIEP he gives lectures to participants in the IIEP Annual Training Programme and has directed several of the Institute's training courses and seminars in Africa and Latin America.

This volume includes contributions by the following:

Vanya Berrouet has served as an evaluation specialist in the Ministry of Education in Haiti. From 1988 to 1992, she was Head of the Evaluation Services Team of the *Incentives for Improving Basic Education* Project, operated by the Haitian Foundation for Private Education and which is described in the case study which she co-authored.

Rajayswar Bhowon is Chief Education Officer and Head of the *Planning, Research and Monitoring Division* of the Ministry of Education and Science, in Mauritius. He also served as the Deputy Chairman of the committee preparing the Master Plan for educational development in Mauritius.

Udo Bude is Head of the *Formal Basic Education Section* of the German Foundation for International Development in Bonn. He also serves as a frequent advisor to the German Ministry of Economic Co-operation. He has extensive experience in teacher training and the development, implementation, and evaluation of curriculum in developing countries. He has published widely on issues related to the quality and efficiency of basic education in the Third World.

Vinayagum Chinapah is Deputy Director of the *Institute of International Education* at Stockholm University. He is also Associate Professor of international and comparative education and Head of the Masters degree programme in social science at Stockholm University. Previously, he served as a secondary school principal and a secondary school teacher in Mauritius. He is widely published in the field of international educational development and has extensive experience in developing country settings.

Anthony Cresswell is Associate Professor of *Educational Administration and Policy Studies* at the State University of New York at Albany. He has consulted widely in both the USA and in developing countries in the area of educational planning, school efficiency, and finance. He is co-author of 'Teachers, unions, and collective bargaining in public education' (McCutchan, 1980) and 'Education and collective bargaining: readings in policy and research' (McCutchan, 1977).

Frances Kemmerer is an Associate Professor in the *Department of Educational Administration and Policy Studies* at the State University of New York at Albany. She also serves as Institutional Co-ordinator at the University at Albany for the USAID funded *Improving the Efficiency of Education Systems* (IEES) Project. Her specialty is the allocation of resources within systems and schools.

Ayélé Kudjoh is Chief of the *Evaluation Section of the General Directorate of Educational Planning* in the Ministry of Education, Togo. She has participated in several sector studies and has particularly dealt with problems of educational financing.

Antoine Levy, from 1986 to 1992, directed the School Administrative Services Team of the *Incentives for Improving Basic Education* Project, operated by the Haitian Foundation for Private Education and which is described in the case study which he co-authored. He is active in private education development in Haiti.

Alain Mingat is Professor at the *University of Dijon-Bourgogne*, France, and researcher at the *Institut de Recherche sur l'Economie de l'Education* (IREDU). Previously he served as Director of the *Centre National de Recherche Scientifique* (CNRS) and as a researcher with the World Bank. He has published several books concerning tools and instruments for the analysis of the functioning of the education system and studies on the efficiency, equity, and financing of education. He has conducted comparative studies in Asia and Africa.

Ernesto Schiefelbein is an economist in the UNESCO *Regional Office for Education in Latin America and the Caribbean* (OREALC), Santiago. He has also worked at the World Bank in Washington, D.C. and at the *Centro de Investigación y Desarrollo de la Educación* (CIDE) in Chile where he was the Co-ordinator of the Latin American Educational Research Exchange Network (REDUC). He served as Head of the Chilean Educational Planning Office from 1965 to 1970. He is the author of numerous publications, such as 'Eight years of their lives' (with J.P. Farrel, Ottawa: IDRC, 1982) and 'The state of education in Latin American countries' (Santiago: UNESCO/OREALC 1990).

Karen Tietjen is an educational economist working as a private consultant in educational research and project design in developing country settings, particularly in Africa. From 1988 to 1992, she was Director of the *Improving Basic Education* Project in Haiti and Research Associate in the Learning Systems Institute at Florida State University. Her recent publications include 'Educating girls: strategies to improve access, retention, and achievement '(1992, Washington, D.C.: U.S. Agency for International Development).

Thomas Welch is Senior Education Specialist in the *Center for Development Policy at Research Triangle Institute* in North Carolina. He serves as Chief-of-Party on the Egypt *Educational Planning Activity* Project funded by USAID. Previously, he was Director and Senior Advisor to the Aga Khan Foundation.

Douglas M. Windham is Distinguished Service Professor at the *State University of New York at Albany* where he teaches in the Department of Educational Administration and Policy Studies. A specialist in the economics of education, he has published extensively on the issues of higher education finance in developed countries and on fiscal policy and macro-educational planning in developing nations. Recent publications include, 'Indicators of educational effectiveness and efficiency: constraints, issues and policies' (with David W. Chapman, JAI Press, 1990), 'The cost of effective schools' (1990, in Fundamental Studies on Educational Research, P. Veeder, Editor, Amsterdam: Swets and Zeitlinger), and 'Indicators of educational efficiency: a three-phase program' (The Forum, 1, 2, 1990).

Part I
Introduction

Chapter 1

Improving educational quality through better use of information

David W. Chapman
State University of New York at Albany, USA

Lars O. Mählck
International Institute for Educational Planning,
France

A priority in many initiatives to improve the quality and efficiency of education in the Third World is the increased use of information in policy formulation and planning. Advocates argue that only as the dimensions of an education system and the problems that beset it are clearly understood can appropriate planning and management of the education system occur. This view has lead to a considerable amount of attention and resources being devoted to the design and implementation of Education Information Systems (EIS) as a means of providing decision-makers with more accurate, relevant, and timely information. However the increased ability to collect and analyze information has not necessarily led to improved educational practice (directly or indirectly) at the levels where it matters most – in the schools and classrooms where the real process of education occurs. While *considerable creative thought* has been put into the design and operation of information systems for central ministry planning, *far less* has been given to ways the resulting information can be used to actually affect practice at the school level. This represents a major challenge in educational planning and is the principal topic of this volume. This book identifies and synthesizes lessons learned from current research and practice on the use of information systems to improve educational practice, particularly in ways that result in improved educational quality and efficiency.

Audience

This book is intended for educational planners, administrators, and information management specialists concerned with the link between *having* better information about the education system and *using* it

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Edited by
David W. Chapman
and
Lars O. Mahlck

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effectively to improve practice. It is also intended for international development specialists, especially those in international assistance agencies, who have been the advocates and sponsors of many of the efforts to improve information as a means of strengthening the education sector.

The volume is designed to stand alone as a resource book that synthesizes current thinking and recent experience in information management. But it is also intended for use within larger training programmes aimed at education and government leaders, particularly in Third World settings, who are attempting to raise the quality and efficiency of education through the more effective use of information in decision making. Finally, its emphasis on the links between *theory* and *practice* makes it especially appropriate as a textbook for a variety of graduate-level international education courses.

Sponsorship

This volume is jointly sponsored by the International Institute for Educational Planning (IIEP) in Paris and the Improving the Efficiency of Educational Systems (IEES) project. The IEES project is a ten year project (1984-1994) to assist ministries of education in planning, policy research and implementation of interventions to improve educational efficiency. The project is operated by a consortium consisting of Florida State University, the State University of New York at Albany, and the Institute for International Research, located in Washington, D.C. A key area of work has been to assist participating countries to better use information in planning and management aimed at improving educational quality.

The International Institute for Educational Planning (IIEP), established in 1963 in Paris by UNESCO, promotes training and research on educational planning in relation to economic and social development. The IIEP's Annual Training Programme in Educational Planning and Administration organized at its Paris headquarters is attended by planners from Africa, Asia, Arab States, Latin America, Europe and North America. The Institute also conducts a variety of training seminars and workshops at regional and national locations throughout the year. As part of its continuing commitment to provide relevant, timely, and appropriate training, the IIEP regularly sponsors studies to identify and investigate emerging issues in educational development, planning, and management. The collaboration of IIEP in the present project reflects this commitment, and its recognition that the improved use of information in planning is a major issue in the continued development of education in many of its Member States.

Overview of the book

This monograph is organized in four parts. Part I provides an introduction to the volume and a summary of the issues addressed in the following chapters. Part II consists of four *Issue Papers* in which leading education development specialists consider ways that improving education information systems can contribute to enhanced quality and efficiency of education. In Part III, four *Case Studies* describe how countries have responded to the challenge of improving the quality and availability of education data and how they have used such data. Finally, Part IV, *Conclusions*, offers a set of *Observations* based on the preceding papers and suggests a series of next steps in the continued development and use of information systems in ways that will promote effective and efficient schooling.

The decline in educational quality

To appreciate the widespread interest in information systems as a tool for improving education quality, it is necessary to understand the convergence of pressures that now threaten educational quality and efficiency. During the 1970s and 1980s, many developing countries experienced explosive growth in their education systems. This growth was a reflection of both rapid population growth and an increased participation rate (the percentage of school-age children enrolled in grade one). In response to this enormous social demand for education, countries recruited teachers and administrators faster than they could be trained, resulting in large numbers of unqualified and underqualified personnel being released into the schools. The rapid growth in the teaching force put great strain on national education budgets, even at a time when many countries were experiencing serious economic and fiscal problems. As money became tighter, ministries of education cut back on textbooks, instructional materials, instructional supervision, school construction, and maintenance and let teachers' salaries fall behind the rate of inflation. The convergence of these factors left countries with less well qualified teachers in front of larger classes, often in poor facilities, without textbooks or any source of instructional assistance. Quality of education dropped sharply, leading parents to question the value of education for their children. In some countries, enrolment began to fall, even as the school age population continued to grow at unprecedented rates. This pattern – uncontrolled education expansion followed by quality decline – with notable variations, occurred in many Third World countries.

Government response to these pressures was constrained by weak management systems. Management systems, administrative procedures, school-ministry communication, and logistical support came under severe pressure and, in some countries, fell far behind the quantitative growth of the education system. Education managers had little objective information on which to base their decisions, even at a time when the education system was becoming exponentially more complex. (For a discussion of these trends, see Lockheed ; Verspoor, 1990; Windham ; Chapman, 1990; Ross ; Mählck, 1990).

As the efficiency of education dropped, the consequences of low quality education were felt in other sectors of the economy. School graduates had fewer employable skills. National development efforts were slowed. In response, governments began to re-examine their commitment to education and its role in national development and some governments launched new initiatives to improve their education systems. At this point, however, the problems contributing to low education quality are many, complex, and inter-linked. Improving the quality of a nation's education system is not just a matter of getting textbooks out to the schools, finding transport for instructional supervisors, or upgrading its management system, although all those things are needed. It is a matter of making all these things happen at once, in a co-ordinated way. Moreover, the economic problems that led to the quality deterioration in the first place are still present and in some cases, have become worse. The present challenge, then, is to extend access and upgrade the quality and efficiency of education within a context of severely constrained resources.

Why the interest in information systems?

A consistent finding of studies conducted across a variety of developing countries during the 1980s was that education managers needed more training, but that even if they had adequate training, they often lacked basic information about the dimensions and operation of the education system on which to base their decisions (see Government of Liberia, 1988; Government of the Yemen Arab Republic, 1985; Government of Haiti, 1987; World Bank, 1988; Caillods, 1989). In particular, these studies identified the lack of timely, accurate information on the number and distribution of students, teachers, schools, and instructional materials as a major impediment to more effective allocation of recurrent resources. The identification of weak management capacity as a central constraint on educational development led to widespread interest in strategies for human resource development, including the strengthening of management practices (Hallak, 1990). Advocates of improving information pointed out that the benefits of training were lost if education managers, once trained, did not have the data they needed to support improved planning and management practices. Along with training, then, improving the information available to decision-makers was identified as a key element in improving educational management and, in turn, the efficiency of the education system.

This interest in better information as an input to more effective planning and management converged with two other factors. The first was a growing pressure on donors themselves to be more accountable for the development funds they spent. In addition to believing that education ministries needed better information to guide their own decision process, international assistance agencies came under new demands to demonstrate the impact of the funds they distributed. Donor agencies responded to these pressures by mandating more and different types of data be collected by recipient countries as part of project evaluation activities. The development or upgrading of a country's education information system was included as a component of many donor-sponsored projects (Ross ; Mählck, 1990).

The second factor was the advent of inexpensive, powerful, and portable microcomputers which made it possible to handle more data in a cost-effective manner. The new technology made it possible to handle large amounts of data quickly, at a relatively low cost. Moreover, the introduction of microcomputers had an important symbolic value to many governments which viewed the rapid spread of the technology as evidence of modernization.

How information can be used to improve the quality and efficiency of education

Information can be used to improve educational quality in four principal ways by: (i) providing data that are used directly to secure or allocate resources; (ii) constraining 'bad' decisions; (iii) detecting inefficient resource use; and (iv) supporting mechanisms that offset the impact of resource loss (Chapman, 1990). The first of these – *to describe the status, identify trends, and develop projections* – which can be used as the basis for resource allocation decisions, represents the most direct use of information. It is the cornerstone of the rational decision making model and the central tenet of most arguments for improving information systems. Advocates point out that an understanding of the basic dimensions of an education system is prerequisite to meaningful planning. These basic descriptive data, collected consistently over time, can be combined to show trends which, in turn, can be used as the basis of projections. For example, enrolment and teacher supply data, when examined together, can suggest the need for new teachers in a given year. When examined over several years, such data can inform teacher assignment policies, instructional supervision strategies, teacher training needs, and facilities construction.

Perhaps a more frequent use of data is to *constrain bad decisions*. Data may be used more often by political or professional adversaries to head off a decision they regard as unfavourable than by policy makers in formulating a policy in the first place (Chapman, 1990). Presenting a positive plan may require a coherent weave of data, while an attack on someone else's plan may only involve a focus on one dimension of that plan. In some settings, this pattern of use was seen as a threat to established authority and elaborate procedures were designed to limit access or data distribution; in other settings, multiple data systems were implemented by different offices within the same ministry seeking statistics in support of their particular interests. In others, however, it led to more open debate about the appropriateness and potential impact of policies.

Information can be used to detect inefficient resource use, particularly as it can be used to clarify the relationship between alternative inputs and subsequent student performance. Recent research suggests that the relative impact of such interventions as pre-service teacher training, instructional materials, and instructional supervision on student performance differ across countries (Lockheed ; Verspoor, 1990; Fuller, 1987; Chapman ; Snyder, 1992; Heyneman ; Loxley, 1983; Abdulmalik, 1991; Postlethwaite ; Wiley, 1991). Education managers need to monitor the impact of these inputs within the context of their own countries. For example, expanding teacher training may do little to improve educational quality if graduates use their additional skills as a route of access out of education. Raising teacher salaries may not enhance educational quality if it does not result in improved pedagogical practices, and may actually lower quality if teacher salaries divert funds that would be better used for instructional materials or school lunches.

One of the most popular rationales for improved information management within both education ministries and donor agencies is the potential of the information system as a supporting mechanism to help offset the impact of resource loss. In many countries the attractiveness of teaching has diminished as teacher salaries have fallen behind the rate of inflation. Education ministries have tried to offset this trend by the more effective use of non-monetary incentives. For example, teachers may be offered advanced training, subsidized housing, or preferential future assignments in return for remaining in the system or for accepting a less desirable current assignment (Kemmerer, 1990; Kemmerer ; Thiagarajan, 1988). Many such non-monetary incentives require a data system capable of tracking teacher assignments and matching teachers with incentive opportunities (Chapman, 1990).

Education development specialists generally have not suffered a lack of ideas about how improved information for planning *might* contribute to enhanced quality and efficiency. Yet there is growing concern that these investments in improving information management systems are not having the anticipated impacts. Part of the problem can be attributed to the inappropriate expectations of early advocates about the impact information would have within what is essentially a political decision process. Resource allocation and planning decisions in education are always made within a larger social and political context. Those who assume improved information contributes directly to improved decisions are quickly disappointed. However, most advocates of improved information systems have operated from a more sophisticated and realistic understanding of decision making. It is their concern that poses a more serious challenge to continued investment in information systems as a means of improving education.

Problems in linking better data at the national level to improved school practice

Four main factors contribute to the problems now being experienced in using national level data to improve school practice:

1. *The school and classroom factors that contribute to improved student achievement in developing country contexts are not fully understood.*

There are, for example, serious debates on the relative efficacy of pre-service teacher training (Lockheed, Verspoor, et. al, 1991; Chapman ; Snyder, 1992), textbooks (Jamison et. al, 1981; Heyneman; Jamison, 1980, 1984; Lockheed, Vail ; Fuller, 1986) and instructional supervision (Plank, 1990; Chapman ; Burchfield, 1991) in raising student achievement. Faced with limited resources, governments face hard decisions about what interventions to support, typically at the cost of de-emphasizing something else. These trade-offs must be evaluated from a recognition that improvements will not occur by modifying a single factor in isolation, but by altering several of them at the same time (Caillods; Postlethwaite, 1989). Only as these relationships are clarified will policy-makers have a clearer sense of what investments are most likely to raise student achievement. While to some extent this lack of information can be attributed to the problems of conducting classroom level research in Third World settings, much of it is due to the under-utilization of data that are already collected. The data are not collected or analyzed at a level of aggregation or in ways that address these questions. For example, few countries adequately analyze the regional disparities in the quality of education services provided (Carron ; Ta Ngoc, 1981). Similarly, most countries collect measures of student achievement, but relatively few countries combine this achievement data with information on cost and resource distribution to examine which factors are most consistently related to higher levels of student performance.

Across countries there are important differences in what teachers regard as effective teaching practices, the ways that teachers and students view their respective roles, and how students' knowledge of content is demonstrated. For example, Bae (1987), comparing Korean and American elementary school teachers' beliefs about effective teaching, found that American teachers assigned greater importance to clarity of presentation, pacing of instruction, use of questioning, allocation of practice time, teacher-student rapport, and teacher enthusiasm as indicators of effective teaching while Korean teachers assigned more importance to the availability of instructional materials. Chapman and Kelly (1981) found that the dimensions on which Iranian and American high school students evaluate their teacher were substantially different, though the dimensions they used to evaluate characteristics of the course and content were similar. What students believed constituted effective teaching differed across countries.

Given the variability in the relationship between classroom inputs and student performance across countries and over time, such analyses need to be conducted on a country specific basis and repeated frequently. Within countries, once the relationships between school factors and student performance are identified, that set of relationships presumably will suggest ways that managers can shape inputs to encourage educational processes that result in improved learning outputs. Such optimism is tempered by classroom level research already conducted which finds that the relationship of school inputs to learning outputs is far more complicated than most educational leaders want to believe (Fuller and Snyder, 1992; Chapman and Snyder, 1992; Anderson, Ryan and Shapiro, 1989). There are no quick fixes. Good classroom process data do not tell managers what to do.

2. *The way in which central level policy operates to affect the behaviour of school level personnel is unclear.*

Too often, central policy-makers believe their job is done when policy is formulated and rules promulgated. They often have little idea of the extent that policies are implemented and little incentive to find out. Consequently, it is not uncommon to find ministry-level decision-makers proudly heralding the formulation of policy they believe will change educational process or outputs, yet find teacher and school level administrators totally unaware that such policies had been enacted or, if aware of the policies, unclear about what actions are expected from them. Part of the problem is traceable to poor ministry-school communications; some to a lack of incentives at the school level for implementing new policy and an absence of sanctions for ignoring them (Kemmerer, 1990). Some of the problem is the organizational structure of the educational sector. Education in many Third World countries is best characterized as a 'loosely coupled system' — a system characterized by little or no communications among units, poor supervision, slow or absent co-ordination among departments, failure to implement rules, and frequent and unpunished violations of rules (Nagel and Snyder, 1989; Weick, 1976).

Even when ministry-school communications are good, centrally dictated policies may interact in unanticipated ways, ways that create problems worse than those the policies were intended to solve. For example, the adoption of new instructional materials, intended to improve student achievement, may raise the complexity of teachers' worklife which, in turn, sparks teacher resistance. The challenge of formulating effective policy aimed at improving school practice is twofold: (i) to reduce the complexity that proposed changes pose for teachers and (ii) to create sufficient incentives to compensate teachers for the increased complexity teachers do experience. Effective policy formulation at the central level needs better mechanisms to monitor impact at the district, school, and classroom levels.

3. *Much of the argument for how better information might improve school practice is concerned with resource allocation decisions. In fact, many ministries of education have extremely few resources they can effectively allocate.*

The most direct and obvious point of intervention of central ministry personnel in school level activities is through resource allocation decisions. While this is the central argument of many information system advocates, it may be based on a weak premise. Resource flow may be largely fixed or changes linked to such severe political costs that meaningful manipulation of resources to affect the education process is unlikely. Ministries of education may have fewer resources to allocate than is generally recognized. The case of pre-civil war Liberia illustrates the point. Over 95 per cent of instructional costs were locked up in salary which was distributed directly by the Ministry of Finance. Even if reductions to the teaching force were effected, it was not clear the savings would have reverted to the Ministry of Education.

Similarly, in the search for equity, many countries have adopted formula driven distribution systems in which changes to the formula become hotly contested political debates — would-be losers seeking to block the changes. Resources that are seemingly discretionary (e.g., textbooks, number of teachers assigned to a school) can actually be changed only through belaboured and politically risky debate.

4. *Ministry officials may not have (or may not believe they have) the authority to make the decisions suggested by the data.*

Education systems in nearly all Third World countries are set up and operate as steep hierarchies, organized through a system of highly compartmentalized departmental charters and job definitions which define who is responsible for each task. Officials who have access to data summaries often do not have the authority to act on the information available to them nor any responsibility to share it with others that do (Savage, 1990, p. 98; Imboden, 1980). This is particularly true at intermediate levels of the Ministry hierarchy. Loyalty to one's unit is given higher value than actions on behalf of the overall system.

Over the last decade, many educational planners and managers bought time by arguing they needed better information to guide their actions. But the situation is changing. Substantial progress has been made by many governments in extending their capacity to collect, analyze, and report information about their education system. Often that success has been twinged with disappointment. Decision-makers expected that, with better information, alternative courses of action and the relative trade-offs represented by each would be clear. Seldom is that the case. If anything, more elaborated information only highlights the interlinked, complex nature of the issues under consideration.

Some officials have used this as justification for continued reliance on more intuitive grounds for decision making. For them, the available data will never be of sufficient quality or quantity to forego their present style of management. Many others, however, have developed a more realistic understanding of the role of quantitative data in planning and management and are seriously seeking ways by which central and regional level administrators can encourage better educational practice in schools, where the real processes of teaching and learning occur. It is to this group that the following chapters are addressed. The following *Issue Papers* and *Country Studies* explore strategies through which better information can inform school practice, analyze the experience of selected countries in implementing school improvement initiatives, and, examine assumptions about the link between planning, school practice, and student learning.

Summary of issue papers

Decentralization of the administrative structure has been widely suggested as a means of improving educational practice. Advocates argue that management decisions made closer to the level of the school can be more responsive to differences in local contexts and needs. Aggregate data often mask underlying trends which, if recognized, would lead to more differentiated response on the part of decision-makers. A key element in moving decision making closer to the level of the schools, then, is providing managers at those lower levels with the information they need as input to their decision making.

Windham, in *Chapter 2*, examines the potential benefits and problems encountered in decentralizing educational decision making, the role of information in the operation of a decentralized system, and the demands that decentralization places on a management information system.

Windham points to an increasing recognition that both equity and efficiency of education systems may require a more decentralized structure. Individuals holding different positions in the education structure often require different types of information, depending on their area of responsibility, personal capabilities, and interests. At the same time, he expresses caution about too quickly accepting the benefits of decentralized data use. Its major justification is to narrow the diversity within the groups for whom educational decisions are being made. However, the distribution of constituent views within the micro educational unit may be as diverse as in the larger units. The decentralization may only lead to a 'balkanization' of the education system. This, in turn, can lead to diminished political support for education as a variety of views emerge among the decentralized units and a strong centralized voice is lost. Further, decentralization can take a variety of forms – Windham discusses four: *regionalization*, *multiple administration*, *nuclearization*, and *deconcentration* – each with its own set of implications for decision making. The key question is what authority is (and is not) being given to decision-makers away from the center, and to whom are they accountable.

Decentralization appears to evolve through three stages: (1) the preservation of greater detail in individual and school characteristics in national data collections; (2) greater local participation in data analysis; and (3) decentralization of authority over selected types of educational decisions. Windham observes that the major barriers to decentralization are inadequate availability of the prerequisite technology and communications infrastructure, inappropriately trained people and, most importantly, the lack of political and administrative will to change. Even when clear advantages of devolving decision making are evident, there is often reluctance on the part of central leadership to yield authority and responsibility to lower level administrators.

Windham sees an irony in the impact of communications and data processing technology on organizational structure. While the technology change has made decentralized systems more realistic, it has had an initial effect of reducing the urgent need for decentralization, as central decision-makers have access to more disaggregated data. He offers five approaches that can be used to encourage decentralization: (i) increasing local accountability, (ii) providing training and technology, and (iii) encouraging data based management, requiring detailed educational indicators, and promoting local generation and management of funds.

One of the most perplexing issues facing policy-makers is to identify teacher practices that can be meaningfully effected through policy interventions initiated at the central and regional levels of the education ministry. To the degree teacher behaviour is a function of teacher personality or aptitude, teachers' classroom practices are unlikely to be alterable through changes in policy. On the other hand, to the extent classroom practices are related to teacher compensation, availability of instructional support, working conditions, and opportunity for professional advancement, centrally initiated policy changes probably can lead to meaningful differences, if appropriately targeted and implemented. This possibility has sparked considerable interest in the design and operation of teacher incentive systems.

In *Chapter 3*, Kemmerer examines the importance of effective information management in the operation of a teacher incentive system. She offers a model of the factors affecting teacher performance, describes the conditions necessary for creating an effective incentive system, suggests a set of incentives that governments might use to encourage teacher recruitment, performance and retention, and discusses how management information systems can be used in implementing such an incentive system. Incentive systems vary in the behaviours they seek to encourage, their comprehensiveness, the actual reward (or penalty) employed, and the timing of the reward. A system of incentives designed to attract and retain teachers in teaching may look quite different from one aimed at encouraging teachers to alter their instructional practices. Kemmerer points out, however, that all incentive systems are, by definition, intentional and extrinsic. Incentive systems are similar in that each of them identifies the target group, the behaviours to be rewarded, and the rewards associated with those behaviours.

A key characteristic of any incentive system is perceived equity. Teachers must believe that their demonstration of desired behaviours will lead to a reward, and that those not demonstrating the target behaviour will not receive the reward. This necessitates the operation of a reasonably efficient information system, both to monitor target behaviour and distribution of the promised incentives. Kemmerer argues that if management information systems are to contribute to improving classroom practice, they need to be designed in quite different ways than they now are and, in particular, suggests the need for two major shifts from current practice: a shift from a summative to a formative orientation and a shift from one-way to two-way communication flow.

A management information system is too often conceptualized as a vertical flow from school to district, region, and eventually central ministry levels. Often overlooked is the importance of horizontal information sharing. Bude, in *Chapter 4*, focuses on the importance of information sharing among teachers themselves. He argues that teachers are the key factor in all attempts to improve the quality of education. Efforts to improve learning conditions and instructional practices must begin, Bude contends, by assisting teachers in their teaching by showing them alternative pedagogical approaches. Bude describes typical pedagogical practices in Third World settings and suggests a series of stages that characterize teachers' movement from using instructor centered to student-centered pedagogical practices. At each stage of the model, Bude suggests variables that might be altered to improve educational performance.

Quality improvements in schools start with paying serious attention to teachers. Information will only have a positive effect on classroom practices if teachers are actively involved in the information transfer process. To improve quality of instruction at the classroom level, teachers need information about what they are expected to achieve with their students, how much instructional material is (or will be) available, what they are expected to teach, and the most effective pedagogical strategies. But teachers are sources as well as recipients of this information. Teachers need to collect more qualitative data at the classroom level about materials, techniques, and activities that work well and those that do not.

His central argument is that information to improve instructional practice will not flow down from central ministry sources, but will come through information sharing among the teachers themselves. Effective information systems need to include horizontal as well as vertical linkage. His argument is illustrated by examples drawn from instructional materials development in Zimbabwe, the use of teachers as instructional supervisors in Pakistan, and a learning support system for primary teachers in Indonesia.

Welsh, in *Chapter 5*, examines the linkage between education information and educational quality. He argues that societies and organizations have informal *information structures* that serve as a basis for sorting and channelling information and converting it to policy, plans, tactics, and operations. Use of and access to this information are the product of relationships. *Information systems*, on the other hand, tend to be formal, following a set of clearly articulated rules governing information access, flow, and use. There is often a tension, Welsh suggests, between the information structure and the information system. The conservative emphasis of the former competes with the performance orientation of the latter. The tension is most evident during times of change, when informal personal relationships clash with the formal organizational relationships demanded by the information system. Indeed, the imposition of a formal information system often results in a loss of the informal structures through which much communication flows.

Information structures and information systems, Welsh argues, are founded upon valuing systems which define what information is relevant and appropriate as a basis for decision making. To understand how data can affect educational practice, it is necessary to understand the manner in which the dominant valuing system of a country shapes what is regarded as relevant information for decision making.

Resistance to change can be understood, in large part, as conflict among valuing systems. The demand for change (embedded in the call for educational reform) is often a demand for a new mix of the old, change which does not challenge the basic valuing system or people's ideas of relevance. The tension experienced in change is due to the manipulation of tolerances (in the existing value system) rather than to a fundamental shift in values. The learning needed to accomplish the change is a new mix of the old. On the other hand, change may involve a shift to a new valuing system which, in turn, will demand a new definition of quality and require different types of information in support of decision making.

Improving the education systems requires changes, many of which require reorienting the underlying valuing system of the society. It is this valuing system that defines what information is regarded as relevant, and consequently, defines what is included in the formal education information system. But the situation is more complicated. Different levels of the education system may operate under quite different incentive systems and may handle information in quite different ways. It is not enough to consider a change in the valuing system over time; the differences in the valuing system that operate across levels of administrative authority must also be considered.

Welsh points out the steep pyramidal structure of the information system in many countries. The number of key actors diminishes at each subsequent level up the Ministry, from teachers to minister. Each upward movement compresses and diminishes the data flow. The refining and sorting at each level is reinforced by different interpretations of what is considered relevant, practical, and operable. On the downward flow, there is expansion, elaboration, and interpretation. At each level there is a reformulation of the message, a massaging of the information which is intended to sustain relationships and mitigate the harshness of instructions being passed down. There is an understandable wish to retain good working relationships with people at the surrounding levels. Welsh argues that information systems would be better designed as early learning systems rather than as early warning systems. This essentially involves providing incentives for people within the system to change and adapt with the system.

Country studies

Perhaps the most widely endorsed strategy for using national level data to improve actual classroom practice is to provide schools with information on how their students scored on national examinations relative to other schools in their immediate vicinity, in the region, and in the country overall. The test data provides a standard against which teachers can gauge their performance. Advocates argue that the feedback helps generate healthy competition among schools, fuelled by teachers' pride, fear of sanctions, and perhaps by pressure from parents (Israel, 1987; Middleton, Terry, and Block, 1992).

One of the most widely publicized examples of a national effort to improve school practices through dissemination of examination results was undertaken in Kenya in the early 1980s (Somerset, 1987). While short-term results were very promising, the ministry discontinued the practice soon after the conclusion of the external technical assistance which had helped support the effort. Nonetheless, the Kenya experience became a widely cited example of how school process could be affected by the provision of information. Other countries, however, have tried a similar strategy with somewhat differing results, most notably Chile.

In *Chapter 6*, Schiefelbein presents a critical analysis of the experience of Chile in undertaking three national assessments of student achievement over the last 20 years as a basis for improving educational quality. Schiefelbein describes the goals, operation, and impact of each assessment and offers an appraisal of why the efforts failed to have the intended impact. The Chilean experience was based on two assumptions. *First*, as content areas characterized by low student achievement were identified, teachers would be able to improve their instruction in those areas. Similarly, if schools were identified as having a particularly low level of student achievement, teachers in those schools would be motivated to improve their teaching. *Second*, parents would be able to move their children to other schools if teachers were not responsive to the information on student achievement. These assumptions were not confirmed by the subsequent experience. Media reports of school achievement were frequently misleading. The media often compared schools on single variables rather than on more complex sets of factors, resulting in oversimplifications that distorted more complex underlying relationships. The media failed to explain differences that were an artifact of the way the system operated rather than a reflection of teacher diligence. For example, the media reported that private schools scored higher than public schools without explaining that, by law, public schools had to accept students refused admission to private schools. Differences probably were due more to the student composition of the schools than to the instruction students received. The dissemination of school level achievement data back to the schools, intended to spark competition among schools and draw attention of teachers to their pedagogical practices did not result in measurable increases in average school achievement scores during the period of the assessment. Neither did it reduce disparities in achievement across socio-economic groups over time.

Schiefelbein offers two explanations for the constant level of achievement over the period of these three assessments. First, senior ministry officials did not make effective use of assessment results due to high turnover of ministers, top officials were unable to see the potential policy use of the assessment results, and they encountered problems in getting the analyses they wanted in a timely way. Second, there was an incorrect assumption about how teachers would interpret student achievement scores and how they would see their own role in raising those scores. The initial assumption was that teachers, presented with evidence of low student achievement, would be a driving force for change. However, the Chilean experience suggests that teachers held reasonably low expectations for student performance and were satisfied when students exceeded those low expectations. If achievement results were lower, teachers blamed factors outside of their control. If results were higher, teachers saw no reason to change their methods. Consequently, there were few ways in which the achievement results could have impacted teachers' classroom behaviour.

Schiefelbein while providing useful information on organizing, budgeting, and implementing a national assessment, cautions seriously the probable impacts. The chapter provides a sobering assessment of the assumptions that lead education ministries to undertake this type of initiative as a means of improving education quality.

Planning is not a matter of organization and technical co-ordination, but a matter of identifying and justifying the most basic choices of educational policy. Yet in few, if any, countries do educational planners have a clear idea about what organization and policy choices will lead to the educational outcomes they seek. Kudjoh and Mingat, in *Chapter 7*, argue the importance of analyzing student and school level data as a means of identifying the contribution of educational inputs and processes to pupil performance. At the same time, the authors point out that, across different countries, educational inputs and school characteristics appear to have quite different impacts on the functioning and eventual products of schooling. It is often a mistake to assume that interventions and strategies successful in one country will necessarily be successful in another. Rather, relationships between inputs, processes, and outputs need to be tested anew in each national context.

Kudjoh and Mingat report on a national study in Togo to illustrate how student and school level data can be used to explore relationships that can guide educational planning and decision making. While raising a series of methodological and conceptual issues encountered in conducting this type of study, they present findings from the Togo study that illustrate the usefulness of this approach. Among their findings:

- Pedagogical effectiveness of teachers explained more variance in student achievement than did school organization variables. Factors under the control of educational planners had less of an impact on pupil performance than factors under the control of the teachers themselves.

- The impact of the availability of textbooks on pupil performance differed by subject. In reading, more books led to higher achievement. In arithmetic, they did not.

- Students in multi-grade classrooms had higher average achievement than students in single-grade classrooms. The positive gain in achievement outweighed the negative impact of larger class size.

- Teachers' level of education did not make much difference in how much students learned. There appeared to be a saturation effect. Given the nature of the tasks primary school teachers are expected to perform, education of primary school teachers beyond upper secondary school may yield little or no return on the investment -- at least in terms of pupil achievement, at least in Togo.

- Pupil achievement was significantly higher in classrooms in which the teacher and students did not speak a common local language. In such cases, both reverted to French, the official language of instruction. The extra practice paid off.

Kudjoh and Mingat use the Togo case study to illustrate three points. *First*, large-scale correlational studies can be undertaken successfully in low-income countries such as Togo. *Second*, such studies can yield findings and insights that go well beyond those that emerge from the routine collection and reporting of education statistics typically undertaken by education ministries. *Finally*, while these types of analyses can be useful in informing policy, they are not, by themselves, a sufficient basis for policy formulation. Other considerations (such as costs) need to be considered.

In *Chapter 8*, Bhowon and Chinapah use a case study of educational planning in Mauritius to point out that one of those other considerations is the political dynamics that operate in any process of educational reform. Educational planning is not as rational or linear as some advocates suggest. The authors suggest that, while improved information about the dimensions and dynamics of the education system can contribute to development of more relevant solutions, it is a marginal contribution to what is essentially a political process. In analyzing the consultative process used in formulating the recent national education reform in Mauritius, they describe in considerable detail the series of meetings, commissions, and consultancies undertaken in developing the new education Master Plan. Their case study helps illustrate the issues that must be addressed, the types of information seen as relevant, and the negotiations that must ensue if the multiple constituencies of education are to support a reform. The case clearly illustrates the need for thorough analysis and interpretation of available data. If information systems managers and research and development staff are not able to work out the implications of their findings and translate them into policy options, there is little hope that decision-makers will use the information.

In *Chapter 9*, Cresswell, Tietjen, Levy and Berrouet trace the impact that introducing a computer-base EMIS had on the management of an educational project in Haiti. The Incentives to Improve Basic Education (IIBE) project, aimed at strengthening private primary schooling in Haiti, involved a complex programme of incentives, research, and support services administered by a non-governmental organization. Improving information management was a centerpiece of the project, and implementation of a project-based EMIS was seen as an important mechanism for increasing efficiency of both school and overall project operations. The experience of IIBE illustrates a common problem in information management: planners often lack appreciation of how interdependent certain information processes are in an organization.

Advocates of EMIS argue its value in terms of improving school practice through the management of incentives, improved resource allocation procedures, and the conduct of programme evaluation. The Haiti example illustrates the types of unanticipated problems that often are encountered when new information management procedures are employed to accomplish those ends. For example, the IIBE project operated from the premise that schools and teachers would respond to incentives for improved performance. This involved getting control of incentives. However, changes in incentives had serious repercussions at political levels. Similarly, efforts to improve resource allocation (specifically, school orders for instructional materials and supplies) created problems when the list of choices available to schools expanded (due to computerization) to the point that staff had trouble handling the increased complexity of the requests. The use of the EMIS to improve programme evaluation led to a cycle of escalating requests from sponsors and stakeholder groups for more and more information, that often appeared to be de-coupled from any clear plan for use.

The Haiti case study also addresses a series of more micro issues in information management, specifically, the unintended impacts of new software on project operations. In introducing new information management procedures, initial design decisions are often made within a narrow frame of reference and fail to consider a number of organizational and environmental constraints which later interfere with success of implementation. Only as these information management applications are put into full operation are these interdependencies revealed. The Haiti example illustrates the way in which the accumulation of seemingly minor irritations encountered as a result of computerizing aspects of information management – the kind of thing often overlooked at the planning stage – converged to threaten the implementation and impact of the computer application. Secretaries rebelled, there was not enough room on the hard disk, users didn't know the software, the computers were too slow, people kept changing their information needs.

Cresswell, *et al.* argue that too often there is a simplistic and unrealistic understanding of all that is necessary to get an EMIS integrated into operation of the ongoing structure. Implementers too often operate from a utopian view, that oversimplifies and underestimates the real problems encountered in replacing old technologies with new, or from tunnel vision, in which attention is concentrated on the details of the computer application instead of the interdependence of the information processing activities with other parts of the project. They point out also that EMIS are generally designed to fit the current system. Too often, no provision is made for the EMIS to grow as the project or education system grows. In the Haiti example, as the project grew, the information management applications became less effective and harder to sustain.

Finally, *Chapter 10* offers a set of observations based on the preceding chapters and suggests a set of the next steps to take in order that the experiences of countries, in improving their education information systems, can be shared in ways that lead to more effective and efficient schooling.

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Part II
Issue papers

Chapter 2

Strategies for decentralizing data use

Douglas M. Windham
State University of New York at Albany, USA

Introduction

The last decade has seen a tremendous increase in the promotion and introduction of Educational Management Information Systems (EMISs) around the world. The bureaucratic need for greater information about increasingly diverse systems of education and the political advantage (heightened by the spread of democratic, or at least representative, government) of data-based argument have heightened the attention given to both educational data collection and to its uses (for example, see Ross ; Mählck, 1990).

During this time few ideas have been more heralded in theory – and more ignored in practice – than the concept of decentralization of the EMISs. In this characteristic EMIS development represents a microcosm of the larger decentralization issues with which education has been faced in recent years. There has been an increasing recognition that both the equity and efficiency of educational systems may require a more decentralized structure. This need is partly a result of the normal administrative diseconomies of scale (the higher unit costs associated with operation of larger organizations) which arise in attempting to deliver comparable quality within a system with increasingly diverse forms of education and training and with increasingly varied needs on the part of its clientele. Windham (1980) has pointed out that:

> **"One must study the complexity of education as it exists, while simultaneously developing a theoretical model of educational processes based upon the response of individuals to perceived incentives and information. . . . Centrist planners, no matter how much discretionary power they have, never determine the actual outcomes of policy. They can only set in action forces which they anticipate will have certain effects. The effects themselves are the results of the millions of micro-decisions made by individuals. . ."**

Ross ; Postlethwaite (1988) have echoed this micro-educational view by encouraging planners to recognize that different information on education will be required by different individuals depending upon their level within the educational system and their personal capacities and interests (see Somerset and Ekholm, 1990, for a related view). The challenge that awaits in the next decade is how to encourage decentralized data use both for its technical planning advantage and because of its ability to democratize the planning process.

The planning context

Adams (1991) notes that the four major intellectual traditions in educational planning, as identified by Friedmann and Hudson (1974), are philosophical synthesis, rationalism, organizational development, and empiricism. Friedmann and Hudson's view is that planning is an activity which links knowledge with action and occurs at the juncture of information and authority. As planning has evolved from the broad context of the philosophical synthesis approach to the frequently mechanistic narrowness of some forms of empiricism, information has increased in importance as a key determinant of planning decisions.

Planning models often are divided between those that are described as 'rational' (e.g. resource allocation, manpower planning, and rate-of-return) and those described as interactive (e.g. political systems and organizational development). This distinction is useful, but not because the models are distinct in their application; every macro-educational planning operation will involve some (at least, seemingly) objective analysis and some interactive decision-making criteria, often involving issues of voting or hierarchical authority. The initial attractiveness of increased empiricism was the hope that greater precision in data and objectivity in analysis would preclude a large part of the need for the 'messy' decision making inherent to political and organizational processes.

This hope has not been realized. First, it was found to be impossible to define much of the precise information and decision criteria by which educational choices should be made. Second, even where such criteria could be stipulated, the political importance of educational systems was such that 'losers' in the technical choice process would take their appeal to the political or organizational system in hopes of winning a reversal or a compromise. Issues such as school location, teacher assignments, social integration of pupil populations, and selection of pupils for advanced study have presented examples where planning systems attempted to apply technocratic processes to what evolved into largely political or organizational issues.

One of the major justifications for decentralization of data use is to narrow the diversity within the groups for whom educational decisions and plans must be made. In this manner it is assumed greater agreement may be reached as to both objective data and decision criteria and the subjective resolution of disagreements can be attained at lower cost. Two difficulties exist with this assumption. First, do the decentralized micro-educational units differ dramatically from the macro-educational ones in terms of the disparity of characteristics? For example, if 30 per cent of the aggregate population advocate more vocationalization of the curriculum and 30 per cent of each of the decentralized units (because of a proportional distribution of this minority) have this same view, it is difficult to see what advantages, objective or subjective, have been gained. Alternatively, the minority group might be concentrated in a single decentralized unit. If they are, then they have a better chance of gaining their wishes there, while in the other decentralized units the reduced size of the minority will make it easier for the majority to have its way. The result, however, is the 'balkanization' of the educational system in a manner that may reduce the general protection of educational interests other than those of the local majority in each of the decentralized units.

The second problem is that reducing the cost of decision making through decentralization may result in a perception of reduced collective (social) benefits. Thus, the aggregate support for education may be reduced as educational variation is increased among the decentralized units. The implication of this is that one may have to anticipate decentralization of financial responsibility as a concomitant or subsequent step to decentralization of authority. Given variations in available resources, some regions may pay a high resource price by gaining an 'autonomy' that cannot be implemented for lack of funds.

In summary, the issue of decentralizing educational data use is nested in two larger social issues: the proper construct of the educational planning process and the justification for decentralization of educational authority. Only when agreement has been reached about the balance between rational and interactive planning approaches and about the proper location for educational authority can the debate over decentralization of data use really be engaged (for more on these issues, see Chapman ; Boothroyd, 1988 ; Chapman, 1990).

Decentralizing educational authority

The common criteria for administrative success include effectiveness, cost minimization, responsiveness to change, and relevance to the external organizational environment (Sander, 1989; Windham and Chapman, 1990). Equity results may be listed as a separate criterion or incorporated as one of the measures of organizational effectiveness.

Broadened participation in decision making normally is considered a means rather than a goal of organizational effectiveness. Decentralization of educational authority, then, is a means for broadening participation, which itself is a means of increasing administrative effectiveness or success. In this section, a brief review will be made of the nature of educational decentralization and of how decentralization of educational authority can promote improved administrative performance. The succeeding section will identify the barriers to decentralization as well as the forces that currently are promoting a greater decentralization of educational authority. Then the following sections will present specific strategies to promote the decentralization of data use and two examples developed for the Peoples' Republic of China describing how interactive programmes of local data use might be applied for primary and for higher education.

Sander (1989), in a review of Latin American experiences with decentralization, notes that the term 'decentralization' describes many different forms of actual administrative operation. It has been used to characterize regionalization (dividing authority by geographical areas), multiple administration (authority divided between central and local authorities), nuclearization (localization of all authority into relatively small units), and deconcentration (a distribution of central officials into multiple locations but with responsibility maintained to central authorities), and others. The question for any scheme of decentralization is what authority is, and what authority is not, being given to the decision makers away from the center and to whom they are to be accountable.

For example, the People's Republic of China has a highly dispersed, multiple administration with a very strong central State Education Commission (SEDC) and decentrally located provincial and local authorities; however, all of the latter are directly accountable to the SEDC. The USA has an arrangement that is apparently similar – a national Department of Education (DOE) alongside state and local educational authorities. However, the DOE is not a major actor in most school decisions in the USA (where local authority has gradually lost much of its historical independence to state regulations and mandates). The test for decentralization of authority is not where decisions are made, but to whom the decision maker is accountable. Accountability has both a legal and a financial base. The central government may establish basic rules or standards to which all educational decision makers are subject and these may be supplemented by other regulations or laws established by regional, state/provincial, or local authorities. Where privately-financed schools exist, they will be required to follow some, but not necessarily all, of the public rules and regulations.

This last point directs attention to the financial base for accountability. The dependence that develops between educational authorities and their sources of funding becomes a powerful determinant of accountability. Governments in both centrist and democratic societies have used financing, and the threat of its withdrawal, as a means of promoting compliance with regulations that do not have a direct jurisdictional application. As was noted above, private schools that accept public funds have been held accountable, in most countries, to many of the regulations governing public schools. Similarly, the private support that is being sought by many developing nations for the financing of local schools (World Conference on Education for All, Jomtien, Thailand, 1990) has required governments that formerly were highly centralized to begin entering into new partnerships with employers, communities, parents, and even the learners themselves. Within broad parameters that vary by society, authority does tend to gravitate toward the source of financing – paying the piper does appear to give one at least the right to suggest the tune.

Lourié (1989) notes that educational decision making is being determined by financial constraints, availability of information, and the quality of information. He suggests that new processes are evolving to meet these determining conditions. Decentralization of educational authority, as one of these new processes, can promote improved educational decision making: by reducing the degree of abstraction in fitting resources to needs; by permitting more prompt response to educational problems; and by clarifying the lines of accountability. Each of these advantages also applies to the specific case of decentralized data use.

Reducing abstraction in decision making

A major constraint on effective educational decision making is the 'informational distance' that exists between the educational reality and the decision-maker. This distance involves physical distance and time but also incorporates the inevitable abstraction involved in the use of summary statistics or trends.

For example, in individual classrooms, the teachers will have relatively detailed information about each pupil's abilities, motivations, and problems. At the school level, the administrator will know some students individually, but will need to make most decisions based on their perceptions of modal characteristics or predominant patterns and trends. However, since the total pupil population remains relatively small, school administrators are more likely to remain informed of some of the most important individual or minority needs within the pupil population.

As one moves from the school to the district, to the region, and eventually to the national level, the information about pupils (or about facilities, books, teachers, etc.) becomes more abstract in two major ways. First, the size and diversity of the underlying situation (what Baron, 1989, calls the "unquestionably complex educational reality") become much larger, making it more unlikely that even a detailed educational indicator system can capture the complexity of the educational system (Levin, Windham, and Bathory, 1990). Second, the decision-makers' first-hand knowledge of the educational system represents an increasingly small proportion of the total. This problem is compounded by the fact that the educational activities with which the district, regional, or national decision-makers are likely to be aware – because of the decision-makers' more urban locations and higher socio-economic positions – are relatively advantaged ones. Many such decision-makers insist they 'know the schools'; however, the schools they know best are hardly representative and even those they may visit during their work may not provide them with a picture representative of the educational conditions of the more disadvantaged half of the school population. These two problems of abstraction – one statistical and the second socio-psychological – are at the center of many of the decision-making failures that occur with centralized systems of educational authority.

Permitting more prompt response to educational problems

Decentralized educational decision making can increase educational effectiveness by allowing a more rapid reaction to problems (or opportunities) that occur in the classroom or school. The higher in the administrative hierarchy a decision must be made, the longer the time necessary to alert the responsible administrator of the need to make a decision, the longer it takes to provide the prerequisite information, and the longer for the decision to be transmitted back to the classroom or school and for change to be implemented.

The failure to obtain textbooks for the opening of school, the unscheduled departure of a teacher, or the need for facilities repairs are examples of problems whose resolution will take longer depending on how high in the administrative bureaucracy the responsibility for such decisions has been vested. In some systems the local district administrator can resolve these issues in a relatively brief period. In other systems with traditional patterns of centralization, decisions about materials distribution, teacher assignments, and facilities are located in individual offices in the central education ministry.

Time and distance are not the only factors at work here, however. The concentration of the decision making responsibility for teacher assignments, for example, means that the responsible ministry office is likely to have numerous teacher assignment requests from schools at any single time. The need by a school for a new teacher that is felt so urgently by the local school administrators and teachers, is just one more piece of bureaucratic responsibility for the central office. In even the best systems the response to the school's needs is likely to be slow; in the less well-managed systems the requests for textbooks, or teachers, or facilities repairs may disappear under the aggregate weight of other, similar requests from other schools. The problem is not one of personnel or of politics (though both may aggravate the difficulties); the problem is inherent in a centralized bureaucratic system with weak accountability for local needs.

In many countries, the school administrator must physically go to the central ministry and 'walk' their requests through the various bureaucratic channels. While this rationing device does establish an implicit priority in terms of local administrator willingness to pursue this course, it is extraordinarily wasteful of the school administrators' time and ability. The inherent administrative delays that are produced by the centralization of authority compound the delays inevitable in the time and distance that exist between the educational activity and the centrally-located decision-maker.

Clarifying lines of accountability

The third factor in educational decentralization that can promote enhanced educational effectiveness is the ability to overcome the imbalance that exists within centralized systems between authority and accountability. When decision-making power is concentrated at the center of any system or organization, the effect is to discourage innovation and initiative at the other levels. The teacher, school administrator, and even the district and regional authorities face strong disincentives for doing anything other than following the bureaucratic rules. If they violate a rule in order to meet some educational need, they are likely to receive little, if any, credit if all goes well and are certain to receive full blame if something goes wrong. It is the nature of centralized bureaucracies to discourage local discretion and initiative in favour of a recurrent referral of requests for decisions up through the hierarchy.

It is not uncommon to observe national ministers or deputy ministers who must review – or at least sign – everything from petrol requests, to purchase orders for stationery, to teacher reassignment forms, to national planning documents. While the administrative folly of concentrating responsibility for all of these activities may appear obvious to most people, the power to delay all such actions by withholding their signature is a major source of the bureaucratic or even political power of these officials. Also, the individuals who will bear the greatest burden of public censure when these activities do not occur are at the local level – the teachers and school administrators. They often are held responsible for decisions over which they themselves have no control. This imbalance between the accountability for decisions and the authority to make them is a source of organizational ineffectiveness, discourages personnel morale, and retards the development of effective partnerships between the school and the community.

Obviously, some decisions will remain centralized in almost all educational systems. Curriculum content and teacher selection standards may be issues not subject to decentralization because of their political or pedagogical importance. However, even in these areas, effectiveness gains may be achieved by allowing for partial decentralization. Local areas or schools could be given the opportunity to supplement the core national curriculum with topics or emphases relevant to their local interests. Also, schools or districts could be allowed to assign teachers based on local attendance patterns or needs. The employment and termination of teachers is one of the rights most frequently sought by local communities in educational partnerships but poses all too obvious problems for some central administrators even where teacher unions are not an effective force for personnel protection.

Whatever the final resolution of the division of authority, there must be a clarification of accountability if the benefits of decentralization are to be realized fully. While the unclear lines of accountability in many present systems may serve to protect the interests of certain central administrators, the situation represents both an injustice to other personnel and a source of ineffectiveness in meeting the need for improved educational decision making.

Barriers to decentralization

The earlier discussion has indicated why so much support exists for decentralizing educational authority; the benefits from increased localization of educational decision making in terms of responsiveness, speed, and quality are real and attainable. Unfortunately, major barriers to decentralization of educational authority exist; these are:

- the lack of political/administrative will to change inappropriately trained personnel;
- inadequate availability of the prerequisite technology and communication infrastructure.

The problem of inadequate political or administrative will has been discussed above. The present system, whatever its failures, does serve the interests of certain individuals and groups. Since these individuals and groups tend to be socially and politically powerful, they will represent an important barrier to change. The barrier can be overcome, however. The means for overcoming this resistance exist in the bureaucratic system's need for legitimacy and for financial resources. As democratic systems have evolved in many countries in the last decade, there has been a simultaneous expansion of local identity. The tensions between the desire for national democratic development and for local autonomy have been obvious in both Eastern Europe and in parts of the Third World. Decentralization of authority is one means of resolving part of this tension.

Bureaucratic legitimacy within a democratic society requires that the public recognizes and supports the bureaucracy's decision-making processes. Even without pressures for greater attention to local and regional interests, this factor alone would lead to an increased procedural openness and to greater attention to the diversity of educational client interests. When combined with political movements to promote local roles in educational decision making, the result is to force even the most reluctant central authorities to reform the present bureaucratic structures. Implementation of this reform will be conditioned by the personnel and technology available to implement it. Individuals who have been trained and conditioned within centralized systems will not automatically adapt to a decentralized one. The ability and willingness of local authorities to begin making decisions will require a basic alteration of the system's 'administrative culture'. In the past, this culture encouraged loyalty, passivity, and a rigid adherence to general rules and regulations. A reactive rather than proactive administrative style was encouraged and rewarded. Simply telling personnel that they now have the right or even responsibility to make certain decisions will not assure that the decisions are made, and assuredly will provide no guarantee that they will be made appropriately.

Any system, educational or otherwise, undergoing decentralization must provide two types of training. The first will inform personnel about the new decision structure and their role in it. The second will provide them with the skills concomitant to their new responsibilities. Both types of training must be available if decision-makers at the regional, district, and local-levels are to have both the willingness and the ability to play their roles in the new decentralized system.

The provision of new technology does not have the sole effect of encouraging decentralization. Admittedly, the communication and data processing technologies are obtainable at such relatively low costs that there no longer is a natural monopoly on such functions by the central offices. For example, where once all data processing had to be handled centrally, personal computers with extended memory capacity can now be made available to local offices to perform a wide range of data management and analysis activities.

However, the same technologies which allow for greater decentralization can be used to maintain and improve centralized decision-making systems. Communications media allow a much more rapid exchange of information and can go far to obviate some of the above-mentioned time and distance barriers that have existed in the past to effective centralized authority systems.

Similarly, the larger capacity of today's data processing equipment allows for the storage and retrieval of detail not possible at central levels in the past. Details on distribution of characteristics, not just mean or modal values, can be retrieved even down to the classroom or individual pupil level. Decision-makers at the central level potentially could become much better informed about the local educational reality than was possible previously. This then is the central irony of the communication and data processing technology's impact on organizational or system authority structures: at the same time that this technological change has made decentralized systems more realistic, it has had an initial effect of reducing the urgent need for decentralization. Over the next decade or two an interesting dynamic will evolve between these countervailing forces.

The most probable change, in those countries of the Third World where the technological infrastructure is not broadly established, is that the reluctant political will to decentralize, the need for changes in training and in administrative culture, and the fiscal limits on procurement of the new technology (even at its relatively low cost) will constrain rapid moves to decentralization of authority. The first effects are more likely to be to 'decentralize' through educational data collection and preservation of greater detail of individual and school characteristics.

The second phase of the evolution will be to provide the necessary technology and training for greater local participation in data design and collection exercises. At this stage, local participants can be given the opportunity to make suggestions for data to be included in surveys and to note special situations or problems that deserve the attention of the central authority. Implementation of this second phase postpones the need for changes in political will or administrative culture while beginning the training and technology transfer activities that are a necessary foundation for an expanded local authority role.

In a third stage, once political will and the administrative culture permit, decentralization of authority over selected educational decisions can occur. One must expect great variation in the nature of this decentralization process from country to country. The specific decisions that are devolved to lower administrative levels will vary as will the levels to which the new authority is decentralized. Some countries may stop at the regional level with little if any change occurring in the role of school or district administrators. Others will shift authority to the district and lower levels; each country will develop a 'matrix of authority' with specific decisions on such topics as curriculum content, teachers, facilities, and instructional materials vested at different points in the hierarchy. However, given the long-term political and financial forces that lie behind the pressure to shift authority away from the center of educational systems, one is safe in projecting some decentralization to occur in almost all systems. The speed with which the change will take place and the final matrix of authority that will evolve will be extremely difficult to project accurately even for individual countries. A special topic of interest will be the role of the private sector, families, and communities within the final structure of educational decision making.

Given this process of evolution, what are the strategies that can be pursued to encourage and facilitate decentralized data use in educational systems? The next two sections review first, a set of strategies that are likely to be of relevance in most contexts, and, second, two examples from the People's Republic of China where decentralized data use has been proposed as a means for promoting more effective educational provision and operation.

Strategies to shift the locus of educational authority and data use

This section will not review the political and social strategies that will need to be pursued to alter the political and bureaucratic receptiveness to decentralization of data use. Rather, the focus here is on five approaches that can be incorporated to prepare for decentralization and to promote its evolution as a means of supporting enhanced educational effectiveness. The strategies discussed here are based on the earlier discussion of the opportunities for and constraints on local decision-making authority. The five strategies to be discussed are the following: (i) increasing local accountability; (ii) providing training and technology; (iii) encouraging data-based management; (iv) requiring detailed educational indicators; (v) promoting local funds generation and management.

Each of the five will be discussed primarily in the context of a third world developing country but much of the discussion will be applicable to the more developed countries as well.

Increasing local accountability

To the extent that both authority and responsibility are concentrated at the center of any authority structure, local administrators and practitioners have little incentive to become involved in data use. Since the local participants (district and school administrators and teachers) operate as implementors – rather than decision-makers, the availability and analysis of educational data is of minor relevance to them. If the local participants become more directly accountable for the effectiveness of local education, they will face a strong incentive to become more active in the collection and analysis of educational data. They may not engage in these two activities themselves — larger and/or wealthier local administrations may have data specialists to collect, assimilate, and report on the educational indicators — but the local administrators will need to know more about these data and begin to use them in the decision-making process.

The common lack of congruence between local accountability and authority was noted earlier. Obviously, investing local administrators and teachers with greater authority will greatly reinforce the effect of accountability provisions. But the increased accountability of local decision-makers will, by itself, initiate a move toward greater local data use.

Providing training and technology

While greater accountability increases the desire of local decision-makers to become involved in data use, the provision of training and technology will allow them to develop an effective capacity for such involvement. The training that is necessary need not be extensive. It is not required that the local decision-makers become statisticians or educational indicator specialists; what they must possess is an appreciation for the proper use of educational data and the administrative skills to ask for and interpret the educational data useful to them.

Where the local personnel must collect and analyse their own data, the central authority can assist by establishing a key set of educational indicators that are suggested (or required) for all areas. Training can then be provided to the local personnel in how to analyse this data set; specifically local personnel can be informed of key criteria by which the data can be judged and of appropriate responses and remediation when the value of select indicators fall outside acceptable limits (e.g. class size, textbook availability, age distribution of pupils, etc.). Similarly, the technology requirements will depend on the fiscal, personnel, and structural realities of the individual country. In some situations, data collection may be regionally or locally supervised; data analysis may be done regionally or centrally; and data use may be a purely local decision within limits established by higher authorities. In other cases, local administrations may supervise all of the data steps from survey design through use.

The decentralization of data use is not a fixed process with a clearly specified outcome. Each country will need to adapt to its own context, resources, and priorities. However, two considerations relevant to sustainability should be at the forefront of all planning for decentralized data use.

First, capacity development should be a key criterion. Training and technology development should have the goal of long-term sustainability. The data use system should build on past experiences. This implies providing training to those who will be involved in data use and retaining the personnel experienced in data use from year-to-year. While national service teams or special external consultants may be less expensive or more effective in the short run, neither system has the effect of developing an on-going internal system capacity for local data use.

Second, affordability also must be a prime consideration for sustainability. An excellent but expensive data collection and analysis exercise that cannot be replicated is less valuable than the establishment of a recurrent data exercise tied directly to local decision-making applications. The decentralization of data use must be fiscally realistic to be sustained and must be sustained to be educationally effective.

Encouraging data-based management

Nothing promotes the use of data more than a requirement for data-based argument. Senior administrators or political leaders can greatly advance the rate of local data use simply by demanding that, wherever possible, the local educational personnel present data support for their arguments. This does not imply that only quantitative data be used or that data alone can resolve the issues being debated – no such mechanistic relationship between data and decision making exists. However, data can help identify and characterize the issues and allow administrators to compare alternative solutions.

It is not enough for senior officials to request data, however. They must themselves be able to ask the correct questions and make judgements about the propriety of data presentations and interpretations. They, or their aides, need to know the strengths and the weaknesses of the data being presented. The goal is to promote a 'market-place' of ideas where opinion and fact are more clearly distinguishable.

Requiring data use at the local levels can be achieved by establishing standards for local reports and for justifications for requests for personnel, facilities, equipment, instructional materials, etc. This will require the local administrators to obtain and preserve the most supportive data that can be developed. Obviously, data can also be used to misrepresent; it is a normal administrative responsibility to create a decision structure wherein local personnel are encouraged to use data in an appropriate and objective manner and are rewarded for doing so.

Requiring detailed educational indicators

One of the most direct means of decentralizing data use is through the establishment of local educational indicator sets as part of the national EMIS. If each local unit is required to create and maintain a set of indicators of educational access, process, attainment, and outcomes, the local personnel will develop both a sensitivity to the value of educational data and a capacity to monitor and apply the results of the data exercise. The encouragement of decentralization does not necessarily depend on the content of the indicators set, but the ultimate effectiveness of the decentralization exercise will be determined by this.

The agreed criteria for data are accuracy, relevance, timeliness, understandability, and affordability (Chapman and Windham, 1986). Unfortunately, no such agreement exists on the proper content of educational indicator sets, local or otherwise. For decades UNESCO has encouraged nations to collect and report a common set of national statistics on education. While the inter-country comparability of these data is highly problematic, trends within countries have been tracked in such a manner as to promote a greater appreciation of the use of such statistics. UNESCO also has provided a major service in supplying training for national educational staff in EMIS development and maintenance.

In the last decade the attention to educational indicators has increased tremendously. UNESCO has conducted an extensive review of the content and use of its national data sets; the World Bank and UNDP have led the way in linking educational data to economic and social data; UNICEF has encouraged the production of qualitative and status-of-life indicators linking education with such areas as health, nutrition, and child care; USAID and other bilateral donors have supported establishment of central and local EMIS structures in a variety of nations; and the World Conference on Education for All (1990) produced, as part of its documentation for the Jomtien Conference, five data sets covering the areas of national background characteristics, indicators of fiscal capacity, indicators of educational efforts, indicators of educational process and results, and indicators of social effects. The data sets were prepared for 129 countries with, of course, certain indicators not available for all countries.

Among developed nations, the OECD had co-ordinated an international educational indicators activity (the INES Project) involving the 24 OECD countries. This work has focussed on six topics: (i) student outcomes; (ii) education and labour market participation; (iii) features of schools and school systems; (iv) attitudes and expectations of parents, students, and the business community; (v) student flows; (vi) costs and resources (OECD, 1991).

The OECD indicator sets represent an application of the input process/output outcomes model which has dominated much of the work of indicators projects (Windham, 1988a). However, like most of the other educational indicator studies, the OECD work has adapted its structure to fit the policy interests of greatest importance to its participating members.

The vast majority of the above-mentioned work on indicators has been characterized by a focus on international comparisons or on national-level indicators. Currently, the International Institute for Educational Planning in Paris is embarking on a policy research programme designed to examine the feasibility of greater local participation in data collection and use. Similar efforts have been proposed by UNICEF and USAID through their regional and national education offices.

The experiences gained from international indicator comparisons will have some transferability to intra-nation indicator use. Issues of comparability, measurement, and interpretation will be faced in the analysis of data sets from a variety of local areas just as they are in combining sets of data from different national systems of education. The strategic importance of requiring a key local indicator set is that it promotes local data use while preserving the central authorities' interest in having comparable data available for all parts of the educational system.

Promoting local funds generation and management

The major justification for decentralization of fiscal responsibility for generating and managing financial resources for education is a fiscal one. Central authorities have found it increasingly difficult (politically or administratively) to obtain the funds necessary to meet the financial demands of the expanding educational systems. With more students participating in education in most countries, more continuing to higher (and more expensive) levels of education, and with the unit costs of education increasing at all levels, central authorities in many countries have shifted some financial responsibility back to local communities and families.

It often is impractical to have these locally generated funds managed by the central authority. As a result, certain local authorities (district officials or even individual school administrators) have been required to manage these monies. The result has been a heightened concern with accountability; it is one of the ironies of educational management that accountability concerns so often focus on relatively small amounts of money while the waste of resources inherent in poor management of teachers or foregone learning opportunities for pupils does not attract comparable accountability demands.

While encouragement of data use is not a direct primary justification for decentralized fiscal responsibility, the latter can have this strategic effect in two ways – both linked to the issue of accountability. First, the need to satisfy central financial accountability demands will require justifications for how local funds were expended. Linking expenditures to data-based evidence of local needs will be a priority means for meeting these accountability provisions.

Second, local parents and other community members will now demand more accountability to them since they are providing more direct support to schools. At all levels of education, increased user fees commonly lead to greater concern by pupils and parents with the use of educational resources. Again, the result is that local authorities will have to make greater use of data to justify their expenditure of funds. This will require that they develop the data systems to collect and assimilate the required information and that they or their staffs acquire the necessary skills in data use.

The five strategies to promote data use discussed here are not mutually exclusive. In fact, most incorporate some aspects of the others. An integrated strategy can be developed for each nation dependent on its present condition and the final matrix of decision-making authority it seeks to develop. The five strategies presented here may be established as part of a larger administrative plan to institute and support the broader decentralization effort.

In the following section two examples will be presented of how interactive authority structures, when combined with local data use, can promote improved educational decision making. It is important to remember that, whatever its ideological context, the localization of educational authority (including local data use) is a means, not an end in itself. The resultant improvement of better decision making in educational experiences for children, youth and adults is the larger goal toward which the localization of data use should work.

Interactive authority and local data use: two examples

The decentralization debate often may lead observers to believe that central or local autonomy are distinct alternatives with no option of coexistence. In fact, the goal of improved educational decision making is likely to require a sharing of authority in an interactive manner. The 'interactive' aspect of the process should evolve from the difference in the natural comparative advantages of the two levels of decision making. The central authority often will have the best understanding of the larger national needs. They will have the responsibility to make decisions among the competing local and regional demands. While they may lack the detail available to the local authorities, they do have the relative advantage of seeing the conflicts that frequently must arise between local and national priorities.

The local authority will always have the advantage of access to more detailed information. The local administrators, however, may not have – or have access to – levels of expertise comparable to those that exist at the central level. Also, as suggested above, there is an inherent local advocacy that results when an administrator's responsibilities are tied to an individual school, district, or region.

The most effective educational authority system is an interactive one wherein the decision-makers at the various levels of authority contribute their perspectives within a clear division of authority and a designated accountability structure. The two examples presented here represent attempts to achieve this form of interactive decision making while promoting greater local educational data use.

Primary school planning

In a study of rural schools in China's Shanxi Province (Windham, Chapman and Windham, 1986), a special focus was placed on the information and decision structures within the Province's primary educational system. The Province had established nine specific goals for the primary education sector:

(i) compulsory education for all;
(ii) improvement of teacher education;
(iii) reduction of dangerous classrooms and full provision of furniture;
(iv) full provision of special facilities (reading rooms, offices, sports areas);
(v) expanded pre-school opportunities;
(vi) increased financial support from community resources;
(vii) continuance of the key school programme (demonstration or model schools);
(viii) improved linkage between the curriculum and community needs; and
(ix) greater student access and equity.

These challenging goals were made more difficult to achieve by the small amount of educational detail available at the Provincial level where decision making was centered. The Province's information system depended on formal annual censuses concerned primarily with enrolment, teacher, and budget data, and on informal communication of critical concerns within the bureaucracy.

It should be noted that both community leaders and school officials demonstrated an excellent knowledge of the basic educational statistics. These same data were available, in aggregate form, at the Provincial level but were used almost exclusively as descriptive input for reports rather than as detailed data inputs for analysis and decision making. Three reasons were given for this situation: the lack of adequate computer facilities; few personnel trained in data and educational policy analysis; and the growing number of schools (making central detailed school-level analysis infeasible without computer support). The information needs of the Provincial Educational Office were seen as growing. Detailed projections of student enrolment by prefecture, county, and individual schools were considered a prerequisite to planning for multi-grade classes, for possible school consolidation, for locating sites for new schools, and for projecting teacher supply and demand. Aggregate analysis (at prefecture or Province levels) of such issues had been of limited usefulness because the group averages disguised important variations that existed within counties, townships, or even within single schools. Since decisions concerning school structures, consolidation, and new locations as well as teacher assignment procedures were centralized, there was an obvious imbalance between the locus of responsibility and the quality of the available data. 'Quality' here refers not only to the precision or relevance of the underlying data collection, but to the loss of information caused by aggregation and the time and distance separating the decision-maker from the educational realities at the school and classroom level.

As an example of how this type of problem might be resolved, an interactive system of teacher and facilities demand and supply was suggested. A basic computer model was proposed for projecting teacher and facilities supply and demand.

The basic design was pyramidal with the base of the pyramid consisting of the 42,000 primary schools and the 4,780 junior and senior middle schools. From this foundation, local data collectors would assimilate data on administrators and teachers (age, qualifications, experience, specialization), facilities (numbers of classrooms, condition, availability of special-use rooms and sports facilities), equipment and furnishings (availability and number – especially of desks, chalk boards and other instructional furnishings), and educational materials (textbooks and teacher guides). Most such data were characterized as readily available at the school level.

An innovative part of this EMIS proposal was that data would be analysed and summarized at each successive level of the administrative pyramid. At the township or town levels, the school would be the unit of analysis; at the county level, townships and towns would be the basic unit; prefecture analysis would focus on variation among the counties; and the Province data analysts would emphasize variation among the prefectures. The value of this division of labour is indicated by the size of the task for Shanxi Province: in 1986 there were 1,916 towns and townships, 118 counties and 11 prefectures (including four cities).

Data aggregation at each successive level controls the total data detail at each level to a manageable amount. An average township would have 22 schools; the average county would have approximately 16 townships; and the average prefectures would have about 11 counties.

An example can be given of how this local data use system can support interactive decision making. First, the shortage or surplus of teachers, by level, qualification, and specialization, can be summarized for a given township as a net surplus or shortage of teachers for each specialization or qualification (it is assumed that township educational officials will have the authority to resolve school imbalances in teacher supply through reassignment of teachers among the township schools). At the county level, the net surplus and shortage of teachers can be calculated after decisions are made concerning reassignment of teachers among the county's townships. Similar reassignments and calculations of the shortages or surpluses of teachers are made at each successive level of the system. At the level of the Province, the net shortage or surplus data (after reassignment among the prefectures is considered) can be used as a basis for advising teacher training institutions on emerging areas of teacher need or surplus.

This model depends on two major factors to be effective: collection of detailed and accurate data at the school level and a decentralization of the authority to reassign teachers to new locations. Obviously real political or administrative barriers to such a programme will arise (anyone familiar with teacher reassignment efforts can anticipate some of these). However, the system has the unique characteristic of promoting interactive debate between the planners at each successive level. The county officials will know their conditions best, but the prefecture officials will be best informed about the pattern among the counties. No mechanistic decision resolution process will emerge, but the decisions will be much better informed than when made by distant Province-level officials who have an inexact picture of conditions and a limited opportunity to engage in debate with officials at other levels. The system described here can be modified to fit other structures and other educational decisions (textbook distribution or relevance of curriculum to local needs, for example). It can evolve to fit the training and equipment provision to the lower levels of authority. It is a system, however, that does allow for the best quantitative data to be matched with the most informed qualitative information in a manner that promotes both decentralization of data use and a matching of authority and accountability.

Master planning in higher education

The second example of decentralized data use and interactive planning comes from China's Provincial University Development Project (Windham, 1988b). As part of this activity, consideration was given to introducing a master planning approach to higher education. The large number of institutions that exist in China, many of unduly small size, and the divided control (with some institutions managed by the national government through the SEDC, others under provincial control, and still other specialty institutions operated by non-education ministries), made the task of fitting the output of the institutions with the needs of the national and local labour markets extremely difficult.

A national master plan, designed by the SEDC based on projections of national manpower needs and estimates of available fiscal resources, was proposed. A draft of this plan would be shared with each province which would then design its own province-level master plan for education. This latter draft plan would then be shared with the administrators of the higher education institutions who would be required to design a master plan for their institution. National institutions and institutions operating under other ministries would not have an intermediate province-level intervention; they would be a direct component of the national master plan.

To this point, the process is a typical 'top-down' scheme, all too familiar to educationalists in China as well as outside. The interactive component is promoted since a second cycle of debate and discussion would be encouraged wherein the institutional administrators would suggest changes in the province's master plan for higher education and the provincial officials could question the national plan's expectations for their province's institutions.

This cycle of interactive discussion and debate will help reduce the number of false assumptions about what institutions can do with their available resources and about the level of additional resource requirements to fulfill new tasks. By encouraging local university and college administrators to produce data-based presentations for their discussion with the provincial officials, a strong incentive for more educational data of a higher quality is instituted. This locally generated data (quantitative and qualitative) would then become part of the basis for the province's reply to the national master plan.

By adapting the draft national master plans to the insights provided at the institutional and provincial levels, a revised master plan could be developed that would be both more realistic and which institutional administrators can feel they have played a role in developing. By linking interactive planning to local data production and use, the proposed master plan system has a great potential to improve the effectiveness of the higher education sector.

Summary

This discussion of the context for and means of promoting decentralized data use has attempted to make several key points:

- the administrative issues surrounding decentralized data are nested within the larger political, social, and economic issues determining the decentralization of educational authority;
- the planning model (including both 'rational' and 'interactive' components) used by a country will condition the attitudes toward decentralization;
- decentralized data use is a means toward improved educational decision making, not an end in itself;
- the test for decentralization is not where decisions are made, but to whom the decision-maker is accountable;
- the major decision-making benefits to decentralization are reducing the degree of data abstraction, permitting a reduced response time, and clarifying the lines of accountability;
- the major barriers to decentralization are the lack of a political/administrative will to change, inappropriately trained personnel, and inadequate access to the prerequisite technology and communication infrastructure;
- as strong at these barriers are, the forces of political and bureaucratic evolution will encourage all systems to move toward greater decentralization of authority and increased localization of accountability;
- the five strategies for promoting local data use must be adapted to the specific decision-making context of each country; and,
- for the full value of local data use to be realized, it should take place within a system of interactive exchange among the levels of the educational authority.

Hallak (1990) notes that any map of the priorities for development in the 1990s must consider the need for correcting imbalances, attaining universal literacy, reducing inequalities in access, expanding coverage, improving quality, and increasing efficiency in the use of resources. It has been suggested here that progress toward all of these goals can be advanced more effectively if attempted concomitantly with decentralization of authority and data use and localization of accountability. However, as Hallak also notes, there is no one single approach appropriate to all countries.

The next two decades will represent an opportunity to observe and learn from the experiences of many countries as they attempt to balance the legitimate political and bureaucratic needs for central authority and responsibility with the equally legitimate benefits to be gained from decentralization. While local data use is only one part of this larger process, it can be a leading wedge for overcoming traditional reluctance to the sharing of authority. Whatever the final system of shared responsibility that results, all countries will continue to be judged by how well their educational systems meet the needs of the children, youth, and adults within their societies.

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Chapter 3

Monitoring teacher incentive systems: a new use for the EMIS?

Frances Kemmerer
State University of New York at Albany, USA

Introduction

Lack of satisfaction with the maturity and skills primary school graduates bring to the marketplace has combined with individual demand for post-primary schooling to create a new era of school expansion in developing nations. That the latest wave of expansion comes at a time when the issues of population growth, the inclusion of marginalized populations, and school quality (defined in terms of school inputs, processes or outputs) remain unresolved is unfortunate. In many countries upward expansion to include the junior secondary grades in basic education can be expected to further strain both the budgetary and the management capacity of the educational system while doing little to effectively increase opportunity; since as Windham (1990) has pointed out expanding access to poor quality schooling is at best meaningless.

Problems in fiscal and management capacity are already evident in falling per pupil expenditures and in the supply systems which form the backbone of national education systems (IEES, 1986, 1988; World Bank, 1988). Materials, training, and even teachers, when distributed, are typically distributed unevenly; with some schools having an oversupply and other schools an undersupply (see, for example, Nielsen and Somerset, 1991). The quantity and quality of resources provided, in turn, place constraints on both school and classroom processes; the processes by which purchased inputs are combined with student time to produce learning.

Given the dependency of processes on inputs and the fact that teachers if not the most important are certainly the most expensive input provided to schools, planners interested in improving system efficiency have increasingly focused on both the quantitative and qualitative aspects of teacher performance. More attention is being paid to teacher attendance in school and in the classroom, what kinds of instruction teachers are capable of delivering, and what teachers ought to do in the classroom.

This chapter examines the possibility of monitoring teacher incentives for performance through the Education Management Information System (EMIS). It begins with a definitional section that includes the characteristics of teacher incentive systems and a model of the factors affecting teacher performance; the assumption here, of course, is that it is these factors that must be manipulated if a change in teacher performance is desired. Next, the conditions necessary for creating an effective incentive system are described. Third, the implications of these conditions for the EMIS are discussed. This chapter closes with a summary and conclusion.

Teacher incentive systems: characteristics and model

An incentive is something that moves people to act in certain ways. It may facilitate, reinforce or reward specific actions. An incentive system is a collection of rewards and penalties and a set of procedures for assigning them to individuals. Incentive systems, by definition, are intentional, extrinsic, and standard (Kemmerer ; Thiagarajan, 1992).

Intentional: Incentive systems are designed to influence employee performance. In the case of a teacher incentive system, the performance may be anything from regular attendance at school to the use of particular methodologies in the classroom. Unplanned rewards and punishments, such as spontaneous praise or blame from parents or the joy that comes from watching children develop, are not considered part of the system since they are not used to manipulate behaviour.

Extrinsic: The consequences of employee actions can result in rewards or punishments that can be classified in four ways:

- intrinsic to the individual (e.g., sense of accomplishment or failure, feelings of pride or shame, increased self-confidence or doubt);
- intrinsic to the work group (e.g., enhanced or reduced collegiality);
- extrinsic from clients and customers (e.g., praise or blame); or
- extrinsic from higher levels of the organization (e.g., praise from the principal or a merit increase in salary).

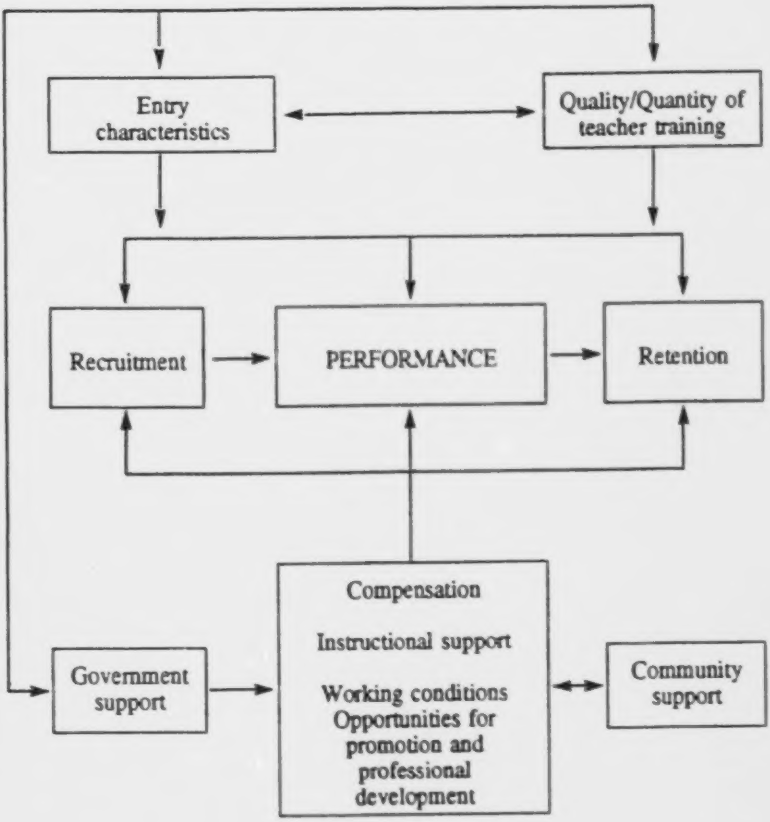
While some incentive systems attempt to maximize returns to teachers by creating an environment that promotes intrinsic rewards both to the individual and the work group, as well as positive feedback from clients, all incentive systems must provide extrinsic rewards from higher levels of the organization. Thus a teacher incentive system must explicitly identify the rewards to be expected for different types or levels of behaviour. For example, teachers who use active teaching/learning methodologies in the classroom or who successfully involve parents in their children's learning may be given special privileges or increases in salary.

Standard: In addition to being deliberate and direct, incentive systems must specify a set of procedures that identifies the target group(s), the behaviour(s) to be rewarded (or punished), and the rewards (or penalties) associated with certain types or levels of behaviour. The certainty of receiving the reward or penalty for specific types or levels of behaviour is an important part of the motivation for performance and as such acts as the lubricant that makes all the parts work. For example, if there is no certainty of a reward for promoting interactive learning in the classroom and it is easier to manage rote instruction, it is likely that lessons will be taught by rote.

While all incentive systems must be intentional, extrinsic, and standard, incentive systems may vary in their comprehensiveness, that is, in such things as the level and types of behaviour that will be rewarded or penalized, the actual reward or penalty for different actions, and the timing of rewards or penalties in a teacher's career. The variable elements in an incentive system, in fact, can be expected to differ with the goals of the system. An incentive system designed, for example, to recruit teachers into the teaching service thus can be expected to differ predictably from one designed to retain teachers or one designed to change the way teachers behave in the classroom. The rewards, for example, would be front loaded — high starting salaries, subsidized pre-service training leading to a higher credential, etc. In contrast, an incentive system designed to change the way teachers perform in the classroom would emphasize longer-term strategies that rewarded effort and progress while penalizing non-desirable activities, such as excessive absenteeism, failure to participate in in-service training, etc. A comprehensive teacher incentive system is one that takes into account and orders all system goals, e.g. recruitment, retention, and performance. A model of such a system is shown in *Figure 1*.

The model in Figure 1 assumes that the primary goal of schooling and, consequently, the teacher incentive system, is to promote student learning, particularly academic learning, and that teacher recruitment and retention are subsidiary goals. In other words, teachers are attracted and retained on the basis of their potential contribution to facilitating student learning. In such a system, teacher responsibilities may then be defined to include a broad range of behaviours extending from regular attendance at school and in the classroom to lesson preparation and delivery to student evaluation and feedback.

Figure 1. Factors affecting teacher performance


Entry characteristics
Quality/Quantity of teacher training
Recruitment
PERFORMANCE
Retention
Compensation
Instructional support
Working conditions
Opportunities for promotion and professional development
Government support
Community support

Educators' and policy-makers' definitions of adequate teacher performance, however, generally far exceed mere physical presence in the school and classroom, the routine production of lesson plans, and the administration and correction of examinations. Such behaviours, in fact, are assumed (often erroneously) to occur and definitions of performance, where such exist, focus on particular methods of organizing and delivering instruction or changes in student achievement.

The literature suggests that two types of factors affect teacher ability and willingness to meet their responsibilities (however they may be defined). The first set includes teachers' personal characteristics, such as academic ability and the quantity and quality of their education and pre-service training (Fuller, 1990; Thiagarajan, 1990). These characteristics obviously cannot be altered in the short run by an incentive system although they provide a good guide to the type of incentives needed both for recruitment and capacity building in a performance driven system.

The second set of factors – compensation, instructional support, working conditions, and opportunities for professional development and advancement (Fuller 1990; Murnane and Olsen, 1989; Kemmerer and Thiagarajan, 1990; Rosenholtz and Smylie, 1984) – are alterable in the short run and for that reason constitute the very stuff from which incentive systems are made.

These factors are not, of course, single factors but categories of factors. A partial listing of the elements within these categories is shown in *Figure 2*.

As Figure 2 indicates compensation includes salary, benefits, and payments-in-kind (free, subsidized housing, etc.). What is considered adequate compensation is assumed to depend on the interaction of an individual's characteristics (education, familial responsibilities, etc.) and labour market preferences and consequently, the individual's alternative employment opportunities. Thus, a compensation package that attracts primary graduates to teaching is not likely to attract secondary graduates since the latter generally have a wider set of job opportunities. By the same token, a compensation package capable of retaining some secondary graduates may not be sufficient to persuade secondary graduates who are heads of households to remain in teaching. Equally important, compensation adequate to induce teachers to remain in the teaching service may not be sufficient to lead teachers to place a higher priority on their teaching job than on their 'second' jobs. Hence, the importance of integrated incentive systems which bundle multiple incentives and disincentives to yield a push/pull effect.

Figure 2. Inventory of potential teacher incentives

I. Monetary compensation

A. Salary

- Number & size of increments
- Regularity of payment
- Merit pay

B. Allowances

- Materials allowance
- Cost-of-living allowance
- Hardship allowance
- Travel allowance

C. Bonuses

- Merit pay
- Attendance bonus

D. In-kind salary supplements

- Free or subsidized housing
- Free or subsidized food
- Plots of land
- Low interest loans
- Scholarships for children
- Free books

E. Benefits

- Paid leave
- Sick leave
- Maternity leave
- Health insurance
- Pension
- Life insurance
- Additional Employment
- Teaching (e.g. adult) education)
- Examination grading
- Textbook writing

II. Non-monetary compensation

- National or regional or local recognition
- Choice of next assignment

III. Instructional support

A. Material support

- Student and teacher texts & guides, supplementary materials, & science equipment *on time, in all subject areas, in appropriate language*
- Copy books
- Pencils
- Chalkboard

B. Supervisory support

- Regular instructional observation
- Provision of demonstration & feedback
- Evaluation

IV. Working Conditions

A. School facilities

B. Classroom facilities

C. Workload

D. Class characteristics

- Number of students
- Age range of students
- Grade range of students
- Ability range of students

E. Collegiality

F. Principal leadership

G. Community/parental support

H. Health & safety conditions

V. Opportunities for promotion & professional development

A. Career path

B. In-service training & training for advanced degrees

Of all the categories, what is called here instructional support is conceptually the broadest and most complex and the one about which the least is known.

It includes the curriculum as translated into mandatory syllabi, student texts, teacher guides, and examinations, as well as supervisory services and in-service training. The sources of conceptual complexity are three-fold. First, in most countries, including developed countries, the relationship between the syllabus, the content of textbooks, and examination questions is not straightforward. Texts and/ or exams may be imported and neither may bear much relation to the objectives stated in the syllabus or to each other. Secondly, despite large budget expenditures on administrative and inspectorate salaries, the value added by these personnel, who often have the same level of education and training and experience as the average classroom teacher, is not clear. On the one hand, in many developing countries, poor roads and lack of travel funds have meant that school visits are rare and, on the other hand, in spite of this inspectors still retain considerable power over the promotion of school personnel (IEES, 1984, 1986).

The efficacy of in-service training also remains in question but this is not surprising given the inclusiveness of most definitions.

In-service training typically means anything from a six hour seminar provided by a consultant to courses taken at a university to longer credential upgrading programmes. The evident popularity of in-service training, its potential for communicating standards, and the limited evidence that it is successful in increasing the capacity for performance (Andrews et al., 1990; Gardner, 1990) suggests, however, that further research is needed on the cost-effectiveness of different training options.

The category of other working conditions is an important one. As defined in Figure 2 it includes all the elements that comprise school climate – principals' leadership and management style, collegial support, the appropriateness of the facilities and furniture, health and safety conditions, etc. The relevance of these factors to teacher motivation and effort is fairly obvious. Former teachers in the USA cite working conditions as the primary reason for leaving, while former teachers in Liberia and Somalia cite working conditions second only to salary as the motivation for leaving teaching. (The Metropolitan Life Insurance Company, 1986; Coleman et. al, 1989; Said and Jama, 1989). While much of the recent so called school effectiveness research has focused on developing and testing measures of context, a great deal remains to be learned about how these factors interact with teacher characteristics to facilitate or impede classroom instruction.

As the model suggests there is a direct relationship between the factors that affect performance and those that affect the system sub-goals of recruitment and retention. Teaching is one of the few professions in the modern or monetary sector that the school going public is familiar with. Teachers' status in the community, standard-of-living, and working conditions, are, more or less, matters of common knowledge. This information combined with an individual's own experiences in school determines, to a large extent, the attractiveness of teaching as an occupation (Lortie, 1975). The status of the school system thus feeds back into the ability of the teacher service to recruit new teachers of the quality desired. In addition, there is considerable evidence to suggest that individuals' perception of the quality of their first teaching assignment and their 'success' in teaching also affects decisions related to exiting or staying in the teaching service (Ashton and Webb, 1986; Chapman and Hutcheson, 1982; Rosenholtz and Smylie, 1984).

Conditions necessary for an effective incentive system

Frequently, the existence of goods or privileges with potential incentive value are taken as evidence that an incentive system exists. The fact is that few educational systems have incentive systems focused on teacher performance, much less effective incentive systems. Even in educational systems characterized by an abundance of goods, there is little evidence that poor teachers are systematically pushed/ pulled into being good teachers, that outstanding teachers are rewarded, or that compensation is designed in direct response to opportunity cost. On the contrary, most educational systems tenure teachers early and brook no distinction among personnel save that of years of service and educational qualifications. Some of the reasons for this have to do with the stringent conditions necessary for successful implementation of performance incentive systems.

An effective teacher incentive system assumes that there are: (a) clear system goals; (b) clear standards for teacher performance; (c) criteria for evaluating teacher performance relative to standards and goals; (d) a system for collecting relevant information on teacher performance; and (e) procedures for adjusting discrete incentives and the system as a whole. In addition, the incentives obviously must be perceived as (f) adequate and (g) fair.

Clear system goals: The model of a teacher incentive system shown earlier orders and prioritizes system goals. The goals of most educational systems, however, are frequently unclear and reflect political accommodation rather than rational planning (Kemmerer, 1990; Levin, 1991; Windham, 1988). In many systems, for example, patronage competes with learning goals. Where this is true, objectives related to the provision of jobs tend to dominate those related to student achievement. As a result, teacher supply systems are compromised. Some schools, usually urban schools, benefit from a redundancy of qualified personnel while other schools suffer from a shortage of appropriate staff. In extreme cases, many of the teachers on the payroll do not teach at all (e.g. IEES, 1984, 1986; Kemmerer, 1986; Nielsen ; Somerset, 1991).

The issue of clear goals is particularly troublesome in systems that are characterized by extreme centralization. In the first place, even if the goals are clear at the national level, their communication to the local level is problematic. Further since there may be little real authority or accountability at the local level, central goals are forced to compete with more local preferences. That this is also the case of standards and criteria can be seen in the following sections.

Clear standards for teacher performance: Standards answer the question of what teacher behaviours are believed to be related to the desired system output. In a great many countries, a minimalist approach is taken to performance standards. Teachers are hired, automatically tenured after a year or two, and become eligible for annual cost-of-living increases and step increases dictated by length of service. The only option for promotion is up (teach at a higher level of the system) or out (leave the classroom for school administration, employment in the Ministry of Education, or other jobs). Typically, even in developed countries where evaluations for tenure are mandatory and annual evaluations frequently performed, there are no standards for performance that have widespread support, and consequently no valid criteria to indicate whether standards have been ignored, met, or exceeded.

Moreover, recent research in Botswana (Chapman et al., 1991) indicates that there may well be conflict among the standards espoused by different stakeholders in the system. The Ministry of Education and Culture appears to support the effective school movement's emphasis on active modes of teaching and learning, and the teacher culture the more traditional teacher lecture/student recitation/seatwork modes. Which of these sets of standards is supported by the different teacher training institutes has not been determined, although it would not be surprising to discover that differences within teacher training institutions are greater than those between them. This conflict of standards is exacerbated by a Ministry supported examination system that reinforces rote learning. In the end, and not surprisingly, it is the exams that win. "I think the rote memorization they use here is OK because that is all they have to do in the exam" (Rowell, 1989, p. 17.)

Indonesia's recent restructuring of the educational civil service scale constitutes an unusually innovative attempt to rationalize performance standards. Movement vertically up and diagonally across the pay scale is generated by the accumulation of points. Desirable activities such as directing or participating in in-service training, writing curriculum and developing support materials for what is called active teaching/learning, counselling students, and serving in remote areas, obtaining higher degrees, etc. are each associated with a specific number of points. While the current distribution of points rewards longevity and academic credentials and treats primary teachers and senior university professors alike, the prototype of a rational incentive system is in place and can readily be changed to support specific performance standards appropriate to each level of instruction (Kemmerer, 1990). For example, the system could be structured to reward primary teachers for the type of activities shown in *Figure 3*, while continuing to reward university teachers for publishing, teaching, and service. At the same time, it could penalize undesirable behaviours such as refusal to teach in the school assigned, excessive absenteeism, or over reliance on negative feedback to students.

Criteria for the evaluation of teacher performance and a system for the collection of relevant information: Obviously, the more specific the system goals and the standards for performance, the easier it is to identify appropriate criteria for teacher evaluation. These criteria may relate either to desired behaviours (e.g., preparation of lesson plans) or to desired results (e.g., students, on average, master the subject matter presented). Both types of criteria obviously have serious shortcomings. In the first instance, evaluation can be easily reduced to a mechanical check list with little attention paid to the quality of the behaviour. Hoenack (1989) and Hallak (1990) both make the point that the isolation of teachers while providing instruction and the difficulty of evaluating teaching well reinforces the tendency to evaluate teachers on the basis of the more visible and easier to measure aspects of their work (e.g. attendance, absence of client complaints, etc.).

In the second instance, the danger exists of confusing what teachers do (motivate and facilitate) with what students do (learn). However useful the production metaphor, its literal translation into teachers produce learning has ensured that teacher evaluation remains one of the conceptually murkiest and politically volatile aspects of school management the world over. The most straightforward way out of the dilemma posed by the need to evaluate performance is to allow the managers closest to the teachers to use information on working conditions and instructional support systems to inform descriptions of teacher performance and student achievement. For example, the overcrowding in urban classrooms, the isolation of rural schools, the presence or absence of appropriate instructional materials, differential parental demand for schooling, etc. all affect the teacher's ability to give instruction much less employ the favoured methodologies of the moment or produce dramatic or even average changes in student achievement.

Figure 3. Examples of teacher behaviours

Non-pedagogical

- remote area teaching
- participation in school decision-making
- meeting with parents etc.

Pre/post pedagogical

- attendance
- preparation of lesson plans
- correction of homework etc.

Pedagogical

- communicates clearly
- reviews prerequisite skills
- presents new knowledge
- demonstrates new skills
- provides practice
- diagnoses student problems, etc.
- provides feedback

Information is, therefore, needed on school characteristics as well as on teacher behaviour and student characteristics and student achievement if teacher evaluation is to provide a meaningful basis for the distribution of system rewards.

Procedures for adjusting the system: Static incentives and incentive systems are quickly outdated. Not only do changes in cost-of-living and standard-of-living argue for a dynamic system but standards for practice change as the teacher force becomes more professional and as more is learned about the teaching/learning process. Indicators that the incentive system has ceased to function optimally include such things as: shortages of teachers in particular subject areas; failure to attract or early turnover of individuals with the characteristics desired; high turnover rates; inability to fill posts in remote areas; teacher complaints about working conditions; and parental complaints about school processes and student progress.

Adequate and equitable: Incentive systems obviously will not work if the incentives are perceived as inadequate or unfair. Without belabouring the point, a good or privilege is 'adequate' if it is capable of altering how individuals act. If raising starting salaries by US$50 a month does not increase the number of applications to the teaching service from individuals with the desired characteristics, it is obviously inadequate. If provision of a given set of textbooks does not change how teachers use instructional time, it can be concluded that the textbooks by themselves do not constitute an adequate incentive to use class time in the way desired. The new textbooks may have to be bundled with in-service training and teacher recognition awards to effect the desired change. An incentive system therefore may not work because (a) the value of the relevant incentives is too low, (b) the incentives neutralize each other (recruitment incentives conflict with retention incentives) or (c) the incentives are neutralized by other system requirements (e.g. teacher guides emphasize class discussion and national examinations emphasize rote memorization).

For the most part, clarity in goals, standards, and evaluation criteria forestalls equity problems since clarity by itself rules out a great deal of nepotism and other forms of favouritism. Both equity and effectiveness are likely to be enhanced further by early involvement of the teachers in the design of the incentive systems itself, as well as in the criteria to be used for evaluation. In the case of Indonesia, the application of identical criteria for promotion for all teachers, whether primary school teachers or university professors, would never have happened if teachers had been involved in the system design.

Implications of these conditions for the EMIS

Once an incentive system has been set in place, monitoring it with a view toward adjustment becomes critical if it is to produce the desired results. The current status of many EMIS suggests, however, that such monitoring would require two major paradigm shifts. The first shift needed is from a summative to formative orientation of the EMIS and the second shift is from one-way to a two-way communications flow.

From summative to formative oriented systems: Most EMIS were not developed to serve as monitoring and feedback devices, that is, they were not designed to provide the on-going information needed for system correction. Presumably, they were conceived to provide summary information on the condition of schooling system, that is, to indicate whether or not the system 'worked' but not how to fix the parts that did not. In practice, however, EMIS in many developing nations emerged in response to donor requests for information. Thus in the past decade, there has been an explosion of statistical yearbooks, detailing the quantity of schools, teachers, and students with some countries having rather more information and others rather less. The extent to which even these rudimentary data have been used to inform decisions or to forecast system requirements remains doubtful. Cases of the collection of the same data by multiple agencies, the collection of too much data or inappropriate data, too little analysis of the data, and significant gaps in the data available for decision-making, are all well documented [see Ross ; Mählck (eds.), 1990; Chapman, 1990].

The question is then how can these summative EMISs be converted into the formative systems needed not only to help create the conditions necessary for an effective incentive system but also for more general development efforts.

From one way to two way communication systems: EMIS are often conceived only as information gathering devices, that is, as devices by which planners elicit specific pieces of information from the field. In the case of the EMIS, however, the questions are the message. The types of information requested are translated by system managers into statements of the goals, standards to be met, and criteria by which they will be judged. Thus, if, as in most EMIS, the information requested is limited to counts – counts of teachers, students, buildings, the message is that it is the numbers that are important – that the goal of the education system is to employ (teachers, janitors, etc.) and to expand. Where actual numbers (numbers of teachers and their qualifications and enrolment rates) are regularly inflated in political and policy documents a second message is sent – the actual numbers are not as important as the symbolic numbers, that is, appearances are more important than the underlying reality. This phenomenon is even clearer with respect to national examinations which are an important part of EMIS systems. If the examination questions test rote memorization, teachers will facilitate the development of recall skills. If, however, examination questions are written to test higher level cognitive skills, teachers are likely to concentrate on the development of those skills.

EMIS limited to simple descriptive statistics and functioning as a public relations device obviously represents a missed opportunity to 'inform and negotiate' integrated (and therefore, more or less self-explanatory) system goals, standards, and criteria. As a consequence of the lack of both information and the necessary negotiation, isolated quantitative criteria used to measure teacher performance are often considered illegitimate by the system managers closest to the teachers. In Somalia, for example, prior to its current troubles, it was impossible to collect accurate data on teacher attendance. Regional education officers and principals considered teachers too poorly paid to be held to attendance standards. Not knowing how the information on attendance would be used, they would not risk providing the data to the Ministry. Had the Ministry of Education asked for regional estimates (rather than school by school reports) of attendance rates together with an explanation of the estimates, it is quite likely that they would not only have received reliable data but also some insight into why rates were low and what could be done to raise them.

This example, of course, raises the further question of who needs what data, for what purpose, if the EMIS is to serve formative functions, such as supporting a teacher incentive system.

Information needs of system managers: In terms of monitoring a sub-system, such as the teacher incentive system, information needs are dictated by two factors: position and management responsibilities. Given at least a working agreement on goals and standards, managers at different levels of the system bear differential responsibilities for making the push/pull elements work to maximize teacher performance. Not surprisingly these different responsibilities often require that they collect (or have access to) different sorts of information. *Figure 4* provides examples of the types of information needed by policy-makers and planners, teacher trainers, inspectors, and principals.

As the figure suggests the first type of information that managers need is information regarding the external validity of the activities they are responsible for. In other words, what is the relationship between what they do (plan, train teachers, or facilitate teaching), the presumably agreed upon teacher performance standards, and the goals of the educational system. For example, central planners need to know how discrete incentives and the system as a whole relate to both stated performance standards and the overall goals of the educational system. Further, they need to know whether incentives offered are cost effective, that is, do they represent the least expensive alternative available. If the incentives do not work, planners have to know why since whether the lack of effectiveness is due to mis-communication, resistance in the field, or a competing unintended incentive suggests different policy remedies.

The second sort of information system managers need is related to the internal validity of the activities they are responsible for or the what and why of promoting performance standards in their domain. Thus principals responsible for bridging the gap between national goals and community desires have to know what the community expects of teachers, how that differs from what government expects of teachers, and how that difference affects teacher behaviour. By the same token, teacher trainers have to know what performance standards they are attempting to inculcate and under what circumstances their graduates perform to standard.

Figure 4. Examples of the information needed by managers to support an incentive system for teacher performance

Planners

- correspondence between discrete incentives and/or the incentive system, performance standards, and the goals of the educational system
- cost-effectiveness of discrete incentives and/or the incentive system
- reasons why (or why not) and under what conditions discrete incentives or the incentive system works

Teacher Trainers

- correspondence between the training curriculum, performance standards, and the goals of the educational system
- teacher mastery of skills taught
- teacher use of skills taught

Inspectors

- correspondence between the types of performance actually rewarded, performance standards, and educational system goals
- extent to which elements of the incentive system (or other system requirements) support or conflict with each other
- whether and under what conditions which teachers perform to standard

Principals

- correspondence between community goals, performance standards, and educational system goals
- strengths and weaknesses of individual teachers with respect to teaching and all other job responsibilities
- parent, student, and community evaluation of both performance standards and individual teacher performance

They may discover, for instance, that new graduates perform to standard only in average size classrooms; that they do poorly either in very large or multi-class situations. If the bulk of out placement is to large cities and remote rural areas, this information may indicate that a change in curriculum content or focus is in order.

It should be obvious that the differences in information needs described in the figure are more than differences in levels of the aggregation of data (although these at times may also be dictated – see, for instance, Ross ; Mählck, 1990, Chapter 2).

Policy-makers and planners, in some instances, require highly disaggregated data, such as school or classroom level data, in order to determine the correlates of a specific problem (e.g. high teacher turnover rates; low student achievement) just as teacher-training institutes might use data aggregated to the national or regional level to answer 'what' questions but data disaggregated to the classroom to identify the 'why' questions that need to be asked about post-training teacher behaviour. The fact is that managers at all levels of the system require quantitative data, at different levels of aggregation, and qualitative data. Quantitative data, at whatever level of aggregation, only provide second-hand information, that is a rough image of what is happening where, and under what conditions. At the lowest level of aggregation, it can mimic the purpose of qualitative research by sufficiently blowing up the detail so that 'causes' can be inferred but it never entirely eliminates the need to observe conditions, classrooms, and personnel and to conduct in-depth, open-ended interviews with those most concerned with educational processes.

None of this is to say that system managers do not also have overlapping data needs. They obviously do. Central and regional education officers and teacher trainers, for instance, all require information on shortages and surpluses of teachers, in different subject areas, etc. At the practical level, the information needs of system managers imply the following:

- information collection is carefully planned. Protocols for the routine collection of quantitative data on teacher performance are designed and shared by potential users before they are field tested much less made a permanent part of the information system;
- system managers at each level determine the criteria for performance within their domain and negotiate these with other system managers to ensure they reflect the same standards for performance (e.g. head of the national examination center meets with heads of teacher training institutes, inspectorate officials, and principals to discuss instructional goals).
- collaborative decisions are made about what data are needed nationally, regionally, and locally on a regular basis to determine whether performance standards are being met and what

information can be collected less frequently. For example, at the national level the numbers, qualifications, location, and turnover of teachers might be collected each year and shared throughout the system but information related to the conditions under which incentives work would only be gathered when evidence of system distress or malfunction was found.

- indicators of incentive system distress (e.g. high teacher turnover rates, shortages of teachers in remote areas, etc.) are defined and imbedded in routine data collection and analysis efforts at each level. Evidence of such distress triggers special quantitative and qualitative analyses.
- indicators that changing conditions of schooling (e.g. significant changes in the ability levels of students, longer school years, etc.) or changing characteristics of teachers (e.g., feminization of the teaching force, increase in qualifications) may change the value of discrete incentives are also imbedded in the routine system and also are used to trigger special studies.
- new incentives or combinations of incentives (e.g., provision of teacher assistants, choice of the location of the next assignment) are piloted in schools, regions, etc. and information from the pilot is used to determine wider implementation.

Summary and conclusions

This chapter has defined and described a systems approach to teacher incentives for performance. Such an approach demands not only clear and widely accepted goals, standards, and criteria but also the support of a highly sophisticated information system that is both proactive and reactive in obtaining the data needed for on-going improvement of the quality of education, in general, and the performance of teachers to standard, in particular. Neither incentive systems, with their demand for discrimination among individual teachers (or groups of teachers) who, all else equal, perform differentially nor the EMIS with its demand for open and rapid sharing of information are easy to establish. Both require strong planning functions at all levels of the educational system and strong links among levels. Planning capacity, in turn, is not likely to exist in the absence of decentralized authority and accountability.

These requirements suggest that the prospect for performance systems in public schooling similar to those found in the private sector are rather dismal. It is important to point out, however, that the picture is not entirely bleak. As Hallak (1990) has suggested, even though incentive systems have not (and perhaps cannot work) in many countries, there is some evidence that discrete incentives narrowly targeted on specific behaviours (e.g. attracting teachers to remote areas or increasing the number of women in the teaching force) do work. In addition, there is mounting evidence to show that the expectations and leadership style of principals, the form and content of national examinations and textbooks, and training closely related to job requirements all can lead to changes in teacher behaviour. The real task facing school systems in the 21st century may not be so much improvement in teacher performance as the development, negotiation, and communication of what constitutes performance to standard and what constitutes reliable and valid indicators of such performance. While understandable, it is, after all, odd that so much has been invested in detailing how much students have learned and so little in how and why their learning has been facilitated.

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Chapter 4

Strategies for using information to improve learning conditions and instructional practices at the school level

Udo Bude
German Foundation for International Development, Germany

The question of quality improvement in schools

The formal school systems of countries in the Third World have often been criticized for failing to provide the right kind of education to enable the younger generation to participate actively in the development of their nations. Not only are schools accused of teaching knowledge of little relevance to the realities of the outside world, but also of not providing sufficient training in the basic techniques for communicating in modern societies. However, despite such deficiencies, schools, and in particular primary schools, have suddenly gained a new reputation for playing an indispensable role in the development process. The renewed interest in schools is based, among other reasons, on the results of a number of studies that seem to indicate that, under certain conditions of modernization and social improvement, schools can play a useful role if they provide education of sufficient quality.

The organization of schools and the way learning is organized within such a formal system are world-wide phenomena (Adick, 1989). More people than ever before are exposed to instruction delivered by teachers in schools. There is an overwhelming world-wide uniformity in the structure, content, and common problems of education. If we bring together head teachers from different cultures and environments they will easily find common topics for discussion. Though schools are culturally and environmentally adapted to different societies, they have more things in common than one may initially realize. The days are past when critical voices demanded a de-schooling of society. School is an accepted vehicle for societal transformation as long as it succeeds in providing the three Rs (Reading, Writing, Arithmetic) and the basic skills and knowledge for participating actively in society.

The enormous expansion of the formal school system in developing countries over the last decade was accompanied, unfortunately, by a steady deterioration in educational quality. For example, pupils in Third World schools receive instruction only half the time pupils are taught in the industrialized countries. The reasons for this are manifold, including the problems of teacher absenteeism, low morale and attrition. In many instances teachers are poorly paid and poorly trained. They have to work in a resource-poor environment where their pupils rarely possess needed textbooks or additional teaching aids. As a result, pupils have to stay much longer in schools than expected just to get the minimum literacy and numeracy skills. In some countries, drop-out and repetition rates are extremely high. Moreover, parents grow increasingly reluctant to send children to school at all because they see few advantages of schooling, given the lack of employment opportunities for graduates. While schools cannot be blamed for the lack of jobs, parental confidence can be restored only if schools show a readiness to improve at least the internal efficiency of teaching and consequently produce school leavers who have learned something that is useful in their local environment and which provides the foundations for further education or employment opportunities.

Teachers are the key factor in all attempts to improve the quality of education. This simple fact, however, seems to be easily forgotten when it comes to designing and implementing educational reforms. Teachers are expected to make sacrifices by spending additional hours working with the community, preparing teaching aids, and developing reading materials for their pupils. Teachers have to cope with new curricula, struggle with new subject content, and assimilate new ideas from educationists who expect them to teach modules, make use of peer groups, involve adults from the communities, or work with classes of 60-100 pupils in meaningful activities. If we want to improve the learning conditions and instructional practices in primary schools in the low-income countries, we have to find ways and means that assist teachers in their teaching and show them alternatives to overcome the prevailing 'survival teaching' in the schools (Dove, 1985).

Inside the classroom: what do we know about instructional practices?

Our knowledge of what goes on inside the average classroom in Third World countries is rather deficient (Vulliamy, Lewin, and Stephens, 1990). The educational planner normally does have statistics concerning the physical conditions of the schools but often lacks information about the instructional practices in schools. For example, the amount of furniture or the number of available teaching aids or textbooks per pupil may be known. However, planners seldom know the rate at which the textbooks and teacher guides are used or the resulting classroom interactions. More intensive and well-organized research is required, large scale classroom interaction studies are labour intensive and must span long period of time before yielding meaningful conclusions. Nonetheless, a quick visit to many schools in Third World countries would easily produce the following impression:

Throughout the lesson the teacher dominates, talking nearly all the time, leaving little room for pupil activities. The 50 to 60 students in the classroom remain relatively passive, though they may be called on to solve a task at the chalkboard or to answer stereotyped questions posed by the teacher in a very simple way. Because of the many children squeezed in a small room, there is normally a relatively rigid authoritarian atmosphere in which students are not allowed to express their ideas or feelings. The most important teaching aids are the blackboard, the stick and a textbook. The stick seems to reinforce the teacher's authority or serves as a multifunctional teaching aid. The textbooks for the different subjects not only serve as the teachers' reference material, they operate as a hidden curriculum for the class. If the teacher carries out any exercises with his pupils, one can be sure that they are prescribed in the textbook. The main pupil activities are reading from the textbook or copying from the blackboard. Very often the teacher just reads from the textbook and the whole class repeats in chorus. Lessons or periods do not last longer than 30 to 40 minutes and in many instances rather unstructured teaching ends nowhere because the teacher runs out of time.

Discarding so-called old or traditional teaching habits and trying to follow new teaching approaches advocated so convincingly by educational reforms is not an easy task. It requires patience and a more detailed and intensive knowledge of classroom practices. If we would observe the same class described above over a longer period, we might discover very interesting but different means of classroom interaction. We might find out that the same teacher in the same class interacts differently with different pupils in different subjects. Provided with a bit of help and information, the same reluctant teacher may change her teaching style and try out other methods that would involve the pupils to much greater extent. Additionally, we might find out that certain teaching methods are not applied, even if the teacher has been exposed to them, because they do not fit into the cultural context of the society. Finally, we might discover that the teacher has not understood completely the new progressive teaching methods that put emphasis on the individual children or their active involvement in learning.

This traditional or didactic approach to instruction can be contrasted by a different way of instruction, widely advocated by progressive educational reforms. These teaching methods are characterized by two main elements they are: (l) child-centred and (2) activity-oriented. Teachers are expected to organize structured learning opportunities that take into consideration the children's level of mental and physical development. Continuous active interaction between the pupils and their environment is seen as the best means of gaining knowledge, acquiring facts and developing certain skills. Ideally, the children are actively engaged in exploring or discovering things, interacting with other pupils or with the teacher. Children are organized in groups to carry out activities which are not normally subject-differentiated. Each child pursues a particular task that is part of the group activity. The teacher moves from group-to-group guiding or stimulating the groups or individual children. The teacher stimulates or assists each child according to the intellectual, social and physical levels of development of the child. From time to time the groups are brought together to exchange information or discuss their results among themselves or with the teacher.

The many facets of progressive classroom practices have been summarized by Bennett (1988) and are presented in *Table 1*.

Such an approach to teaching is very challenging for the average school teacher. Not surprisingly, only a minority of teachers even in the industrialized countries is able to cope with progressive classroom instruction. The famous ORACLE study carried out in the United Kingdom between l975 to 1980 to study the effectiveness of different teaching approaches across the main primary school subject areas provides ample evidence of the difficulties teachers face in applying such modern methods (Galton, Simon and Croll, 1980).

The reality is that school practice in industrialized countries differs considerably from the instructional theory. Teachers still prefer teaching the whole class instead of individualized groups and pupils interact much less with their teacher or with other pupils than one would have expected. Indeed, the most successful teaching style for mathematics and language in the ORACLE study was the 'classroom enquirer' style, in which teachers taught the whole class.

Results from recent classroom studies in Germany confirm the findings from the United Kingdom. Three quarters of classroom time was spent teaching the whole class, either lecturing or involving the whole class in question and answer sessions. Group or individual assignments accounted for 7-10 per cent of the time. Progressive teaching methods, like discussions among pupils, games or experiments, were seldom found in practice.

Table 1. Comparison of emphases in progressive and traditional pedagogical practices

Progressive	Traditional
1. Integration of subject matter.	1. Separate subject matter.
2. Teacher as guide to educational experience.	2. Teacher as distributor of knowledge.
3. Active pupil roles.	3. Passive pupil role.
4. Pupils participate in curriculum planning.	4. Pupils have no say in curriculum planning.
5. Learning predominantly by discovery techniques.	5. Accent on memory, practice and rote.
6. External rewards and punishments not necessary.	6. External rewards used, e.g. grades.
7. Teachers give as high priority to social development.	7. Teachers give highest priority to academic attainment.
8. Little testing.	8. Regular testing.
9. Accent on co-operative groups.	9. Accent on competition.
10. Teaching not confined to classroom.	10. Teaching confined to classroom.
11. Accent on creative expression.	11. Little emphasis on creative expression.

Source : Bennett, N. (1988). Classroom processes, teaching styles and pupil achievement.

Many teachers complained that the overloaded curriculum was the main reason for the teacher-centered approach to teaching (Meier, 1989).

Using progressive teaching methods under the conditions of Third World countries is further complicated by cultural and societal features. Children with inquiring minds very often seem to threaten teachers' authority and status in society. Only if teachers themselves experience the advantages of an active and participatory learning process will they be in a position to understand the changes in teaching styles they need to implement in their own classroom (Avalos; Haddad, 1979).

Key elements of quality improvement

We now return to the classroom situations in Third World countries. In 1990, as part of an intensive evaluation of a newly introduced subject in primary schools, called Environmental and Agricultural Science in Zimbabwe, the study team explored patterns of teaching by observing and analyzing 42 lessons (Lewin; Bajah, *et. al.*, 1991). Teachers' use of lesson time was very similar to the research findings from the United Kingdom and Germany. The curriculum and the teaching materials for this subject emphasized the development of process skills, active pupil involvement, and learning through investigating and experimenting. Pupil activities were supposed to be at the centre of the teaching process. Teaching was to rely less on providing facts than on providing experiences for individual pupils that were related to their own environments (Government of Zimbabwe, 1982).

In general, however, most of the lesson time was devoted to the teachers actively questioning pupils, discussing things with pupils, or just talking to pupils, see *Table 2*. Teacher talk prevailed; discussions were dominated by the teacher without much involvement from the pupils. Pupil participation in the question-answer sessions consisted mainly in one-word answers given individually or in unison. Much of the pupils' written work involved just copying exercises or completing standard sentences. Some teachers did make use of opportunities for students to write in own words and recount events they had observed.

Table 2. Profile of lesson time: percentage total class time teachers spend on selected activities

Percentage	
Teacher talks, pupils listen	10.1
Teacher dictates	0.9
Teacher demonstrates	6.2
Teacher/class discussion	19.6
Teacher asks questions	20.0
Teacher works with groups	7.9
Pupils read	2.5
Pupils write	11.8
Teacher reads	0.6
Pupils do activity	18.4
Other events	3.0

Source: Lewin, K.; Bajah, S.T. et al. (1991).

The evaluators also observed some group activities. Many of these practical activities were 'look and see exercises'; very few were real experiments.

The rather high percentage of pupil activities gives only a superficial impression of the actual instructional practices. Good activity based lessons were observed by the researchers. However, only a small minority of teachers were able to integrate an activity meaningfully into a learning sequence. In most cases the practical activities were only loosely related to the intended learning objectives of a lesson.

Improving learning in schools hinges on a set of variables. The situation in Zimbabwe is by no means different from the situation in many other developing countries. The results of this evaluation presently are being used as a basis for discussion among teachers, and regional level inspectors aimed at providing feedback to curriculum developers working on a revision of the syllabus for Environmental and Agricultural Science. Sharing the information in a participatory way may help to become aware of the possibilities of improving the teaching patterns even under the existing conditions.

Bearing in mind the harsh physical conditions in many Third World countries, one may easily be frustrated in advocating progressive teaching as recommended by theories of educational instruction. Nevertheless, schools in Third World countries have to practice such methods very urgently to convince both parents and pupils that children are not wasting time and talents when attending school. The monotony of frontal teaching and the mere transfer of irrelevant facts (compared with life outside the classroom) can only be stopped if schools try to adopt instructional methods that overcome such rigid procedures.

Nonetheless, active, child-centred learning is only possible with the availability of a minimum set of resources: trained teachers, adequate buildings, and class-sizes (not more than 40 - 50 pupils) small enough to involve children in meaningful activities. Under more difficult circumstances, when a teacher faces a class of 60 to a 100 pupils, the application of more traditional instructional methods should not be seen as a disaster. However, even with such methods teachers can achieve more if children learn without fear and are involved in a teaching/learning dialogue.

Recent work in Pakistan helps illustrate different stages of development of primary education (Bude, 1990).

Figure 1 shows that the organization of learning ranges from a situation in which no teaching or learning takes place to a situation where pupils are actively learning in a meaningful way. The continuum in Figure 1 suggests key elements of the organization of instruction in primary schools at different stages.

The variables that influence the quality of learning and teaching within a school system (like service conditions, school organization, teacher training, monitoring, curriculum development, teaching materials, physical resources, and pupil learning environment) are analyzed in different combinations that mirror various real situations found in an educational system.

At the initial level a school situation characterized by no learning or teaching and the assumption that pupils are wasting their time. The next step has been called survival teaching (Dove, 1985), exemplified by the situation in many Third World schools (Lockheed ; Verspoor, 1990). Although in stages 3 and 4 teaching takes place regularly, it still depends very much on the teacher and textbook memorization. There are further indications that lessons are not prepared by teachers, who suffer serious deficiencies in their content preparation.

Presumably, only schools organized as outlined in stage 4 will prepare children in a way that they become literate and possess a minimum knowledge of how to cope with their environment. From stages 5 to 7 the quality of instruction improves dramatically, reaching its peak at stage 7, at which point the combination of variables leads to high pupil achievement on exams. That does not mean that schools at that stage are just examination oriented, but that examination success is seen as an important indicator of school and teacher performance.

Within such a continuum of educational development, the combination of the variables at each stage does not automatically result in improved teaching practices in schools. Rather, the combination at each stage is seen as an opportunity to produce better educational results – if none of the variables are neglected. Every stage along the continuum represents a slight improvement in the learning conditions and instructional practices over the previous stage. However, inputs do not ensure outputs. Educational production studies that have examined the relationship between school inputs and outputs have yielded only inconclusive and many times contradictory findings (Fuller, 1987). Under positive circumstances, instructional practices in schools characterized by the features described can be improved.

Teachers' experience and motivation, the availability of textbooks, time spent in school during the year, and the amount of homework done by students do contribute to higher levels of pupil achievement.

In a study of primary education quality in Tanzania, Mosha (1988) demonstrated that the quality of primary education in five regions in Tanzania was related strongly to the financial support available for primary education, the rate of teacher turnover, effectiveness of the curricula, availability of teacher guides and textbooks, and the general working conditions of teachers, particularly in rural areas.

Figure 1. Development of primary education in northern areas of Pakistan (continuum)

1	2	3	4
• *No teaching/ learning* • Pupils' time wasted	• *'Survival teaching'* • irregular classes • chanting • copywork • physical punishment • textbooks memorized • no planned lessons	• classes held regularly • *teacher-centred learning* • textbook memorization • chanting • copywork • strict discipline (incl. physical punishment) • no lesson preparation by teachers • teachers have deficiencies contentwise	• regular organized classes • lessons are structured • some simple activities for pupils (questions-answers) • mainly teacher talk during teaching • textbook and teaching aids (kit) applied mechanistically • emphasis on memorizing and copying from books (chanting) • discipline kept without harsh punishment • teachers' content knowledge weak

Source : Bude (1990).

Assuming that the quality of instruction in primary schools can be improved if we tackle some of the above mentioned variables, we will now look into the possibilities of making better use of information for reaching this aim.

Information transfer and participation – pre-conditions for better classroom practice

Participation and information are the two key elements in fostering better classroom practice. Participation gives people a chance to actively direct changes and take the responsibility for their own affairs. Information refers to the reception or communication of know-

5	6	7
• teacher master content/teaching properly organised (scheme of work, timetable) • lessons sometimes planned ahead with help of manuals • structured teaching (different steps) aimed at • simple activities with pupils (questions-answers) • teaching kit used for observations, demonstrations • textbook dominates learning but supplemented by examples from the environment • memorization less important • chanting reduced • no physical punishment	• teaching efficiently organised • lessons planned • teaching always structured • child centre of attention • individual children's progress monitored • different activities part of teaching/learning • textbook only start for learning — not memorized • *children learn to apply skill/knowledge under different situation, circumstances* • all learning referred to the environment	• teacher competent to develop lessons according to syllabus • additional teaching/learning materials available • supervisors assist regularly • children chose activities • teacher is highly qualified • teacher is properly paid • teacher is motivated to work with pupils • activities support self-experiences • teachers are flexible in applying teaching methods • children learn concepts not mere facts • teachers master content • children learn to observe, to draw own conclusions • children's experience, teaching kit and teaching aids used meaningfully • chanting only marginally used (e.g. for learning poems, parts of the Holy Koran etc.) • children taken out of the school to discover, observe • friendly atmosphere • high achievements in exams

ledge. For purposes of this chapter, information is defined as written material (e.g. curricula, syllabi, guides, textbooks) usually transmitted down the educational system, and data collected at the school level which is usually transmitted up the system.

An interchange of information in both directions is needed as the basis for dialogue aimed at overcoming obstacles that constrain better teaching.

Information and participation are closely interrelated. Information without the participation of those concerned may result in the mere accumulation of knowledge without its application. Only if the participatory element of this process operates can planners be sure that the information made available will actually be applied by teachers.

Furthermore, participation is not possible without sufficient information in order to enable people to select among several alternatives if decisions are required. It is also important that those who participate in information transfer have a chance to contribute from their own experience. If, for example, teachers never have a chance to express their ideas or share their experiences concerning classroom practices, it is unlikely the mere provision of information about different teaching approaches will fall on fertile ground. Information transfer combined with participation is clearly a two-way-process in which contributors and receivers of information can change their roles according to circumstances and experiences. The combination of information and participation bears the potential to contribute to improvements at the school level. However, neither is it a panacea for all the problems in the schools, nor can the combination lead to major changes in the absence of other essential items.

What kind of information is needed?

In order to function satisfactorily, any system depends not only on manpower and physical inputs but also on a variety of essential information inputs. The school system is no exception, but it often lacks even the minimum inputs for producing the expected results. Many Third World schools lack written information on the aims, content, and methods of the subjects that are to be taught. Instruction is sometimes based on outdated syllabi and schemes of work that have been copied time and again, handed over from one generation of teachers to the next. Teacher handbooks are frequently not available, and often the available textbooks are the teacher's main guide for classroom instruction.

To achieve improvement in the quality of instruction in schools, teachers themselves need clear instructions about:

(i) what they are expected to achieve with their pupils;
(ii) how much time they should devote to each subject each week
(iii) what they are supposed to teach in the different grades; and,
(iv) effective strategy for providing pupils with the different skills, knowledge and attitudes in the respective subjects.

At the most basic level is written information about the objectives to be achieved at the end of a school cycle and the time to be spent on each subject. The syllabus is the main piece of information that states the expected achievements of pupils for a subject and for a certain grade. Therefore, a school should always be in the possession of the latest version of the syllabus and not keep outdated syllabi as the base for their own teaching. Yet evidence from schools shows that the syllabus is not readily available to all teachers.

If teachers are to make use of the syllabus in lesson planning, it has to be written in a plain language and present different aspects of the teaching process in a convincing manner. Noteworthy, for example, is an attempt in Sierra Leone to use the primary school syllabus for social studies at the same time as a guide for teachers. Therefore, the curriculum developers not only included description of the content broken down according to grades, but they suggested teaching methods, gave examples of meaningful learning activities, and recommended teaching materials to be used (Government of Sierra Leone, 1984).

The main items of a minimum information package are textbooks for each subject within each grade. Teachers who are teaching a subject in a particular class should have access not only to the textbook used in that class but also to the whole set, so that they have an idea how the subject is developed through the grades. If the syllabus does not include instructions for teachers on how to teach the subject, a separate handbook for teachers explaining the usage of the pupils' textbook and providing some background information beyond the content in the textbook is required. A set of basic teaching aids should be included in the minimum information package for a teacher. While some teaching aids can be developed by teachers themselves, there are teaching aids of a more complicated and sophisticated nature that should be provided by the education authorities.

Assuming that teachers are trained to make the best use of the minimum information package, we can expect to find an improved level of instructional practice at the classroom level. However, there is considerable room for further improvement as additional information inputs are made available to the schools. In particular, teachers need resource books that contain supplemental information they can use to deepen their knowledge and enrich their teaching. Resource books are not a substitute for proper lesson planning, but they can suggest to teachers how to present material, how to get pupils actively involved in the learning process, and how to set up and conduct relevant experiments and explorations. They can also suggest questions to help hold pupils' interest, recommend other resources, show how to assess pupils' progress, and suggest how to evaluate the teaching process.

Since many teachers in developing countries lack proper professional training, teachers' guides deliberately restrict the teacher to a more rigid way of carrying out a series of lesson plans in a given subject for a particular grade. Such an approach may not be favoured by progressive educators. It can, however, be justified as a means of supporting untrained or poorly trained teachers in their struggle to provide quality classroom instruction.

For practice and reinforcement of what has been taught during the lessons, pupil workbooks are often effective, especially in languages and mathematics. Workbooks are normally designed for use by individual pupils and can be used only once. The workbooks are used in connection with textbooks, since the assignments given in the work books are based on the content presented in the textbooks. In some countries, due to the high cost of workbooks, alternatives have been sought whereby the teachers themselves develop materials and exercises with the help of locally available resources. This participatory and creative approach, however, requires well-trained and motivated teachers who are familiar with these teaching methods.

How to generate and disseminate information for quality improvement: 'trickle down' versus 'networking approach'

In most education systems information is managed as a one-way flow, directed hierarchically from the top. Communication, when it exists, flows down such a structure, with few opportunities for the reverse (Shaeffer, 1991). For example, if there are revisions to the existing curricula, new subjects to be introduced, or new textbooks to be used, the directions and the materials are supplied by central authorities, normally without much chance for intervention by school level personnel. Information tends to be handed down from one hierarchical level to the next, finally ending in the schools, often with little opportunity for school level participation in the decision.

On the other hand, teachers (in particular, headteachers) are expected to provide raw data to the central education authorities, such as the number of pupils enrolled, drop-outs, repeaters, and the hours taught per month. Only on rare occasions are they asked to generate information on qualitative aspects of teaching which might be useful in the development or evaluation of instructional materials. Responsibility for collecting, processing, analyzing, and disseminating these data has to be vested with some unit within the education system. It is important, however, to organize this process of information collection in a way that those concerned with the delivery of instruction have a chance to contribute to the decision process, so that they are not just passive receivers of the results, but an active participant in the process. Participation in the information process is definitely time-consuming; however, it often improves the quality and the reliability of factual information and may increase teachers' acceptance and willingness to implement innovative practices. The advantages of active participation are several: Teachers feel they are respected as professional partners with a chance to contribute from their own experience. Secondly, they have a structure through which they can discuss the innovations they devise with other educators.

"It can work if .." - examples from the field

The following presentation of short accounts of case studies from Africa and Asia is meant to demonstrate the potential of particular ways of transferring and using information for the improvement of teaching in schools. They all deal with the provision of a minimum information package concentrating on the school curricula and its implementation.

Teacher networking: developing instructional materials in environmental and agricultural science for primary schools in Zimbabwe

Zimbabwe became independent in 1980, and started reforming the educational system in order to replace the former racially-based education. Increase in environmental destruction and the dominance of agriculture in society led to the introduction of a new subject at primary school level, called environmental and agricultural science. A new syllabus designed by the Ministry of Education and Culture in 1982 provided rough guidance for the new subject. Teachers' guides and pupils' textbooks were to be developed later. Under the guidance of the Curriculum Development Unit (CDU) within the Ministry of Education and with the assistance of the German Foundation for International Development (DSE), a series of writers' workshops was organized which produced drafts for teaching materials for classes one to seven for the new subject.

The main idea of these workshops was that materials for teachers and pupils for the new subject should be developed in a participatory way in order to ease their introduction and acceptance at primary school level. The organizers, therefore, tried to bring together the experiences of subject specialists, teacher trainers, school inspectors, curriculum developers, and, last but not least, the teachers. The majority of workshop participants consisted of practising teachers who saw the different occasions as a chance to contribute their experience and knowledge to the writing of new guides for their colleagues and books for the pupils.

Each year from 1982 to 1984, between 40 to 50 people collaborated in writing materials for environmental and agricultural science. The participants worked in different groups and developed different lesson units according to the national syllabus. A common format for writing the lesson units was developed in joint consultations and was then followed by all writers. Before writing started there were intensive sessions on the interpretation and practical application of the syllabus content. Many experiments and activities were carried out by the participants themselves prior to recommending the same activity for their teacher colleagues or for the pupils. The intensive involvement with the environmental and agricultural science curriculum also served as a kind of in-service training in curriculum development. Once a lesson unit was developed, it was field-tested under the critical eyes of the other participants and later on revised accordingly.

Two information inputs were very helpful at the beginning of the series of writers' workshops. The Science Education Programme for Africa (SEPA), still functioning at that time as an organization, provided African specialists from different countries who all had been involved in writing science materials for primary schools. The expertise and advice of the African specialists were further enhanced by carefully documented examples of science and agricultural instruction from primary schools from other African countries with which Zimbabwe had had no contact up to then. Over the years, the number of specialists from outside Zimbabwe was reduced and the development of the teachers' guides and pupils' books was more and more taken over by experts from Zimbabwe, either from the Ministry, other specialist institutions, teacher training colleges or the University of Zimbabwe.

The three initial writers' workshops from 1982 to 1984 were complemented by further dissemination activities. The teachers' guides and pupils' books were introduced in the regions through nine regional workshops conducted by the same teachers and education officers who had produced most of the materials during the workshop. A year later, the exercise was extended to the district level. Under the guidance of the different regional panels for environmental and agricultural science, some 55 one- to two-day workshops were held throughout Zimbabwe. Finally, in 1990 an external evaluation took place that provided useful hints for the revision of the curriculum as well as for the finalization of the materials developed.

The implementation of the curriculum for environmental and agricultural science in Zimbabwe was not without problems. The new subject was very demanding and put pressure on teachers and education officers. Classroom work changed, largely because children's activities and topics taken from their own environment were at the centre of instruction.

Prior to the availability of these teaching materials, environment and agriculture were seldom taught in the schools, despite its official inclusion in the primary school curriculum. With the development and piloting of these instructional materials, the situation changed. Due to the participation of many teachers and inspectors in the development of the materials, the subject gained new supporters in the regions and districts who, in turn, helped their colleagues in identifying further instructional activities for the pupils.

As more materials were introduced in the primary schools the school inspectors spent more time explaining the necessity for teaching the new subject and, in response, more activities actually took place in the schools. Substantial improvements could be noticed in teaching. Teachers felt that the education authorities were paying attention to their problems, listening to their proposals, and trying to help them to teach the new subject in a better way. The effect of the materials developed in writers' workshops was further enhanced when commercial publishers published materials for teachers and pupils, independent of those developed by the Curriculum Development Unit. Whereas the Curriculum Development Unit, due to lack of staff and resources, was not always in a position to finalize and disseminate draft versions of the materials; commercial publishers acted much more rapidly.

Evaluations indicated that environmental and agricultural science is taught better than in the past and that students gain more knowledge and skills in science than before the introduction of the new subject. Teaching has changed to a more activity-centred approach and the inclusion of more practical work also has been observed (Lewin ; Bajah, et. al., 1991). Because of the success of the participatory approach in developing the textbook materials and training teachers in their use, the same strategy was employed in other subjects.

The heavy involvement of teachers and school inspectors in writing and piloting materials for environmental and agricultural science and testing them later on was not without problems. Not everybody is skilled in writing precise and interesting material, and many writers used language too difficult for the intended readers. Some writers had trouble finding fresh ways of explaining similar topics. Writers also underestimated the workload the new materials placed on the classroom teacher. In developing science units the problems seem to multiply. The prescribed activities often required that materials be collected or assembled before the lesson could be taught. Even the teacher writers tended to underestimate the difficulties experienced by their colleagues in lesson preparation due mostly to the competing demands posed by their other responsibilities within the daily school routine.

Learning supervisors in the field-based teacher development programme, Pakistan

Learning supervisors are an essential link between teachers and regional education authorities. Learning supervisors are able to collect data concerning classroom interaction and, at the same time, provide instructional supervision and advice. They can play a useful role in keeping information flowing, giving feedback and providing on-going support to teachers after training courses.

Since 1984, the Government of Pakistan has joined with a non-governmental organization, the Aga Khan Foundation, to improve teaching in primary schools in the Northern Areas of the country. As in most parts of Pakistan, the education provided in primary schools (grades 1-5) is characterized by poor quality instruction and low student achievement. Of the 190,000 primary school teachers, nearly 50,000 have received no formal training in teaching (Smith, 1988). The percentage of untrained teachers is higher in rural areas than in cities and higher among women teachers than among men. Even trained teachers often were found to use poor pedagogical practices (Bude, 1990).

The Aga Khan Education Service is the largest private network of education institutions in Pakistan, operating 176 schools in Northern Areas and Chitral in the North-West Frontier Province. The schools mainly serve female students, whereas the government schools are mostly attended by boys. The Field-Based Teacher Development Programme (FBTD) emphasizes in-school teacher training as an alternative to conventional pre-service teacher training. Some 40 to 80 teachers are trained every year by master trainers in one of the Field-Based Teacher Development Centres. These Centres are primary or middle schools that serve approximately ten trainees for one year. The Centres provide training in practical teaching skills and prepare trainees to take the government teacher training examination. Four hundred teachers have been trained so far and more than a thousand teachers have participated in short-term, in-service training courses also offered by this programme.

Improving teaching in schools soon proved to be a matter of not only training the teachers but also of providing guidance and counselling once the teachers were back to their schools. Although inspectors of the Aga Khan Education Service managed to visit each of the schools in the Northern Areas three times every year, their own training has emphasized administrative rather than professional skills and, on each visit, staffing and disciplinary problems tended to dominate the agenda. Consequently, they were not regarded as the best choice of personnel for maintaining contacts with those teachers who had completed the FBTD-programme to ensure that they would not slip back into old teaching habits.

In response, the project established a new cadre of learning supervisors who visit the teachers at regular intervals, observe classes, critically analyze teaching performance, and try to help teachers with difficult points of content and technique. There are presently eighteen learning supervisors in the Northern Areas, each covering an average of six schools. Thus, almost all Aga Khan Education Service schools in the Northern Areas are covered.

The learning supervisors are drawn from the ranks of those who have served already as master trainers, or who have proved to be outstanding teachers and are fully conversant with the principle of the Field-Based Teacher Development training. The learning supervisor acts as a go-between for the project team and the primary schools. Since there is no budget to provide learning supervisors with anything but minimal transport expenses, they have to operate in a cluster of five to six schools near their own schools. They are released by their head teachers for two days per week to visit all the teachers in these schools in rotation and give professional, non-threatening advice and encouragement to all the teachers in the schools, not merely the former FBTD trainees (Greenland, 1989).

The headteachers of the schools visited by learning supervisors were briefed on the experiment and are supportive of the advisory role of the learning supervisors. After each school visit the learning supervisor completes a written report according to a carefully structured protocol. The completed reports are regularly discussed by the learning supervisors (as a group) with the FBTD project team in the regional capital of Gilgit. With the start of a resource centre for teachers in Gilgit, the learning supervisors are also used to disseminate and explain teaching aids to the teachers prepared by the resource centre.

While the project has built on the existing skills of teachers by having learning supervisors provide instructional advice, it does not seem to have built enough on the existing ideas of teachers (Jaffer, 1990). Teachers in Northern Pakistan are mainly at the receiving end of information. Not enough opportunity is provided for teachers to express their own ideas about teaching methods. Learning supervisors need more training in strategies for more effectively involving teachers in reflecting on their own instructional activities.

Professional support system for teachers in primary schools in Indonesia

In 1979, the Active Learning and Professional Support (ALPS), or Cianjur Project, was undertaken to improve primary school quality in the Cianjur District of West Java, Indonesia. Primary schools in Indonesia consist of grades 1-6 and serve the 6-12 year old age groups. The innovative feature of the Cianjur project was a special support system for teachers aimed at encouraging the use of active learning strategies both inside and outside the classroom. After five years of experimentation as a pilot project and widespread acceptance of activity-based learning by children, teachers and parents, the scheme was extended to a limited number of areas of the country (Djam'an, 1991). Further replication is currently underway.

The changes expected in the classroom and the training given to teachers, headteachers, and supervisors have been documented elsewhere (Shaeffer, 1990; Djam'an, 1991, Tangyong, 1989). Interest in this chapter is in the programme's system of supporting and encouraging the teacher as the main actor for improving the quality of primary education. The professional support system component of the project is regarded as the key to the overall success that has led to the dissemination of ALPS to other regions of Indonesia (Tangyong, 1989). In addition to a support and communication system which operated vertically from the Ministry of Education down to the individual school and teacher, horizontal structures were created to ensure a better flow of information within and across schools, greater teacher participation in training opportunities, and sharing of improved instructional materials and methods. Not only were children encouraged to become more active in the learning process, but teachers were encouraged to act creatively and be responsible for the organization of their own in-service training.

The Active Learning and Professional Support Project followed a 'bottom-up' approach to allow for participation and self determination. The different actors in the improvement programme formed their own professional associations for discussing problems, organizing in-service courses, developing materials, and exchanging ideas and experiences. Teachers' clubs and principals' clubs were comprised of staff from five to ten schools; supervisors' clubs were formed at the sub-district level.

The core of the Professional Support System are five to ten schools grouped together in a cluster and the teachers' groups working within it. Teachers meet regularly for half a day every three or four weeks, mainly to discuss classroom problems, to exchange experiences, and to work out new ideas for teaching. Teacher Centres have been established at the sub-district level to provide resources for teaching and to serve as venues for educators conducting meetings or training courses. At the school level there are regular professional meetings chaired by the headteachers. Headteachers are requested to spend some time in the classrooms observing other teachers and providing professional guidance.

Head teachers are not only responsible for the school administration, but are also trained to work with teachers and children to foster interesting and stimulating learning situations.

The focus of the support system clearly is on the local school. As in the example from Zimbabwe, teachers help in the production of teaching materials for the different subjects. Because of their better training and general education, the Indonesian teachers are in a position to play a much more active role in the improvement of classroom instruction than in the case study from the Northern Areas of Pakistan. As in the Field-Based Teacher Development Programme in Pakistan teachers are assisted by headteachers and inspectors. However, they are not only at the receiving end of the information flow, but they also provide information and substantial inputs based on their own experiences with the new teaching approach. Teachers in the Professional Support System help each other by discussing the children's work, planning lessons, and solving common problems. Teachers are also given the opportunity to visit each other in their schools to learn from each other. As Djam'an (1991) reports, at its best this new approach to teaching backed by the Professional Support System gives teachers a kind of professional satisfaction not known before in Indonesia. Teachers feel that they are taken seriously by the education authorities and that they can contribute important information for quality improvement in primary education (Tangyong, 1989).

Even a project as successful as the Cianjur Project is not without problems. The problems are well illustrated by those encountered in the development of pupils work sheets, an idea that was not introduced by the organizers of the project but arose locally as a response to the need to co-ordinate the work of the different teachers groups (Tangyong, 1989). The development of standard worksheets for all classes in a particular area became the main goal of many teacher clubs – clubs which at the beginning were meant also to provide general support to teachers and to develop teaching aids, discuss common problems, and experiment with, demonstrate and criticize alternative solutions to these problems (Shaeffer, 1990).

Teachers do not easily internalize the new activity-based teaching methods. It will be a long time before lasting changes in the instructional practices at the school level will be achieved and it requires continuous professional support to the teachers as attempted by the Support System for Teachers in Indonesia.

Empowering teachers through participatory support and information systems

So far, this chapter has illustrated ways that information can be generated and used to improve the educational experience of pupils at the classroom level. The main thesis is that improved learning conditions are not possible without the involvement of teachers. This involvement requires active participation by teachers and the provision for such participation by central education authorities. Since the finances for providing sophisticated and costly resources for improving school practices are limited in most countries, the most promising strategy lies in the meaningful involvement of teachers and school administrators at the local- and district-levels. The transfer of information within such a context plays a crucial role. Teachers operate not only as the receivers of information, but as creative providers of data and other written materials.

While the information transfer has to be guaranteed in both directions, the information sharing must start with sufficient attention to teachers and their problems in schools. Without support by education authorities, teachers will not be in a position to contribute meaningfully and bring in their own experiences in order to overcome inefficient instructional practices in schools. The case studies presented have shown that, even with a minimum of funding, teachers can be supported with instructional materials and supervision aimed at helping them improve their teaching practice, as illustrated by the Pakistan project. Such a low cost strategy to improve the learning conditions in primary schools seems to be the minimum that is required if better school results are desired.

The contribution of teachers to quality improvement in schools will increase as opportunities for their creative participation in the reform process are provided by the education authorities (Carr ; Kemmis, 1986). The way teachers participate in developing materials for pupils and other teachers in environmental and agricultural science in Zimbabwe, while at the same time improving their writing skills and gaining greater insight into subject matter, is an encouraging example of participation. The most coherent support system to create and disseminate information at the local level is demonstrated by the case study from Indonesia.

Conclusions: what to do next?

In order not to restrict teachers to a passive role in the information transfer, they have to learn how and in what fields their contribution is essential. Teachers can become more meaningfully involved in the evaluation and reflection of teaching processes by regularly observing colleagues during their teaching. A valuable source of information can be a teaching diary kept by individual teachers in which they record the problems they encounter during their teaching. Notwithstanding the interest and the readiness of teachers to provide data about what works within the classroom context, they need guidance in selecting what types of observations to record and share (Webb, 1991). For example, teachers might be encouraged to collect such information as:

- children's reactions to the learning activities;
- what is done to take account of different working speeds of individual children;
- manner in which textbooks are used;

- amount of time spent in whole class, small group, and individual instruction;
- extent to which topics taught in an integrated manner (covering several subjects);
- relative amount of time spent in group activities and more formal class activities;
- the ways children are encouraged to find solutions on their own and to think independently rather than learning by rote;
- the ways in which the national or provincial curriculum is adapted to be more relevant to the local conditions;
- level of pupil achievement; and,
- teacher's evaluation of the instructional strategies used.

If we accept the idea that improvements of learning conditions and teaching can be influenced by an interchange of information we have to provide chances for an active participation of the key actors in this process: *the teachers*.

Teachers have to develop some basic evaluative skills in order to participate in this type of classroom level data collection and use. However, the models of good practice presented above provide examples of inexpensive means of providing a platform for teacher-to-teacher discussion. Equally important is the professional support system that accepts teachers as equal partners with central education officials in the process of improving instructional practices.

Teachers like many other professionals are basically conservative and it is not easy to change their attitudes in a very short time. However, if they are given chances for contributing in a meaningful way and with the prospect of rewards by the education authorities, they can play a useful role in the improvement of learning conditions and instructional practices at the school level.

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Chapter 5

The politics of valuing in information system construction

Thomas Welsh
Research Triangle Institute, USA

> "Perhaps it is our fate to live at the historic juncture where our agencies of information accumulate enough data to complicate matters but have not yet advanced to the point where they can resolve the complications they introduce. At any rate, there seems to be no definite ratio between the quantity of information fed into a computer and the wisdom of the decision that ensues... Systems of information – precisely to the degree that they seek to become more scientific – tend to lock themselves inside their own treadmill. The information will be more reliable the more it deals with hard facts. The harder the fact the more objective and measurable it must be; and thus the fact, to become sheer fact, must exclude everything that is not measured by its own self-imposed standards. So the fact becomes external, and therefore abstract. And the man perpetually buzzing after information usually misses what is really happening, especially in himself. That has been taking place in another region altogether – behind his back."
>
> (W. Barrett, 1984, p.5).

> "But for all its extraordinary capacities, information technology remains a tool of management, not a substitute for it."
>
> (P. Scrivenor, 1991, p.137).

> "The nature of Power is undergoing a truly radical transformation. It is increasingly defined in terms of the maldistribution of information".
>
> (A.S. Abdul ; L.R. Simmons, 1990, p.331).

Introduction

There is a new educational planning perspective advocated for the 1990s which requires that alternative scenarios for improving (or at least maintaining) the quality of education be presented to governments as part of the planning process. The perspective requires that a clear conceptual framework be established that elaborates the linkages between educational information and the quality of education (Ross ; Mählck 1990). Planners, it is argued, need to assist decision-makers at all levels of an education system to articulate important policy related questions, to define the information required to address these questions, and to design the format and scope of the data collection and analyses that must be conducted to deliver appropriate information. To achieve this, planners must be closer to the action, more pragmatic, and more operational (Hallak, 1990). This perspective assumes a clear connection between the information attended to by educational decision-makers and the quality of education provided. It calls for the creation of the information structures and systems needed to provide the 'appropriate information' to be used by the managers. Planners need to work across the spectrum from policy to operations.

This chapter responds to the call for a conceptual framework that elaborates the linkages between educational information and the quality of education. It explores how such a linkage may be conceived and its consequences for the planners who work across the system to achieve qualitative change via information systems.

Information structures and information systems

All societies and organizations have information structures in place. 'Rumour mill', 'insider information', 'leaks' and 'moles' all attest to their existence. At a more significant level, we are aware of each society's world view which guides what is valued and attended to. This world view is not a formal and precise information system, but an extensive, informal, shared sorting system that turns data into information and eventually to policy, plans, tactics and operations. Use of and access to this information are neither equitably nor technically distributed, but are the product of 'relationships'.

The Educational Information Structure (EIS) of society is organic and manifest in what the organizations and institutions of society accept and endorse as relevant, what they will tolerate, pay attention to, and pursue in order to establish 'the good order' which will provide the desired benefits of investment in education. The EIS is organic; that is, it includes the formal and informal, personal and institutional expressions and applications of the rules and conventions used to transform data to information. Through it, the information is brought to bear on choices among courses of action via a loosely articulated socio–political–cultural -religious process. The transformation of data to information, and hence to decisions and action, is a slow and deliberate process as it works through the levels of the social and organizational structure. This process gives priority to the need for continuity rather than to meeting the demands for change. It pursues 'the good order' in the interest of 'the good of order'; it has a conservative, incrementalist emphasis.

An Educational Management Information System (EMIS), on the other hand, is inorganic, an artifact, manifested in what policy-makers, managers, planners have decided to pay attention to, communicate to others, and measure against the education system's policies, strategies, tactics and operations. The collection of indicators contained in the EMIS is directed at accounting for the performance of the education system rather than for achieving the goals defined by policy. The EMIS is a thin, formalized slice through the Information Structure which seeks to inform the information structure. The EMIS is directed to satisfying the need to learn in the interest of performance rather than pursuing continuity. It pursues 'the good direction' in the interest of 'the good of performance'.

The tension between the EIS and the EMIS

There is a tension between the EIS and EMIS that mediates the pursuit of change. The conservative emphasis of the former competes with the performance orientation of the latter. There are periods where the information structure and the information system operate together as in times of political stability and economic growth. Only when there are overt and apparent change elements acting upon the structure (either external or internal) is there a reappraisal of the information flow. As the decision-makers have an interest in both continuity and change, they are constantly shifting between the two systems. How they handle this oscillation has practical consequences for their performance, accountability, and the exercise of their authority. Their informal relationships can clash with the formal relationships demanded by the EMIS. There are risks in coming down too strongly on one side or the other. To mitigate these risks, managers must be taught how to use this management tool.

EMIS demands explicit management rather than implicit administration. Management can be defined as the process of organizing human and material resources to complete a desired task; administration is the application of rules to ensure the efficient achievement of agreed management policy. Management is, therefore, a creative, dynamic process whereas administration is a mechanistic and conservative process. This differentiation is critical to an understanding of some of the management issues prevalent within the education service.

Management policies impose priorities on the behaviour of staff. Functions and expectations of people are made less ambiguous and more exacting. 'A wink is as good as a nod, a contact better than competence,' is no longer acceptable. Concerns about relevance of action, outputs and outcomes erode the prior faith in the information structure. The EMIS insists that working relationships be transparent and clearly bounded. The EMIS monitors performance and insists that persons learn and adapt their actions in the light of new information to ensure implementation of the policies. The learning must enable personnel to move ahead of the curve of change. The resolution of the tension between the Information Structure and Administration, and the EMIS and Management, is a key to achieving policy goals during a situation of change. Until the organization is prepared to shift from administration to management, the building of an EMIS is wasteful and counter produc-tive. The failure to shift reflects either a denial of the need to change, or the belief that critics misunderstand and exaggerate the challenges arising from change.

Those responsible for the construction of the EMIS must begin with an understanding of the information structure. It is no use telling someone to change if it will destroy the working relationships they have in place. Ideally, the EMIS and the information structure will be well aligned. To do this, however, requires that the information structure and the EMIS change simultaneously. Achieving co-ordinated rates of change is important for improvement to occur. It is doubted, however, that perfect co-ordination will ever be achieved. Persons do not march to a single drummer, neither do ministries of education. To expedite synchronization there must be an acceptance by persons in the system that information is not something 'out there' to be harvested, but is actually being created by their structuring of their 'slice' through the information structure. In addition persons should understand that in order for learning and adaptation to take place, they must allow the new information to act upon them as they act upon it. The warnings on cigarette packets are a good example. You always have the choice of ignoring it and risking the consequences.

An EMIS is a mechanism which will hopefully reorient the information structure in a way that will avoid the expansion of irrelevance within the education system and the consequent waste of resources and human potential.

Educational information structures and systems are grounded in valuing systems

There once was a minister of education, one among many, who decried the distorting effects on educational policy of the parental obsession with having children graduate as lawyers, doctors and engineers. When asked about his own children he admitted to having made similar choices on the grounds that as a parent he had to make the best provision for his children in the 'real world'.

The minister's dilemma highlights the fact that all persons have a perspective on the educational system which is time-space-experience conditioned. Attention to the education system is part of attention to the wider social setting. At the heart of what we decide to attend to, nourish, and sustain is our valuing system.

It sets the criteria for the relevant-irrelevant, operable-inoperable, good-bad, and desirable-undesirable. Decision making is conditioned by the criteria of the valuing process. Consensus about values is a barometer for change. The disinterested observer is struck by the degree to which periods of stability and continuity reflect broadly shared value systems and how periods of change and shift are marked by doubt, confusion, violence, debate, and the search for a new (or reinterpretation of prior) values needed to respond to the emergent forces influencing society.

Information structures and systems are founded upon valuing systems: those who wish to achieve changes via the introduction of EMISs must address this. The opening question is: why do persons and organizations behave this way rather than that? Answer: they have learned to value this rather than that and have been rewarded accordingly.

The rule of relevance within the valuing system

> *The rule of relevance defines the criteria used to sort that which is to be included-excluded, made operative or inoperative, and sets the priorities derived from the valuing system. Policy is derived from the rule of relevance.*

Changes to the valuing system shift the rules of relevance which create confusion and lead to obsolescence of knowledge and practice. What once constituted and indicated quality are no longer relevant. The effect of this is dramatic. Sir James Lighthill, a leading scientist, had this apology to make:

> "We are all deeply conscious today that the enthusiasm of our forebears for the marvellous achievements of Newtonian mechanics led them to make generalizations in this area of predictability which, indeed, we may have generally tended to believe before 1960, but which we now recognize were false. We collectively wish to apologize for having misled the general educated public by spreading ideas about the determinism of systems satisfying Newton's laws of motion that, after 1960, were to be proved incorrect."
>
> (Allen, 1990, pp.273-274).

Educational systems are facing the same shifts from earlier certainties. These are exemplified by the choices arising from the tension between quantity and quality provision. A new relevance is emerging. What form this takes will be reflected in the structure and application of new information structures and systems. What is to be included, why it is selected and how it should be applied will be matters of profound debate. Policies directed to change the rules of relevance must be supported by strategies and operational practices directed to changing both the value system and the rule of relevance. The data attended to and the information produced must reflect the process of value change and the emergence of the new rule of relevance being applied. This requires directly addressing value change indicators and incorporating them in the system, at the same time building a capacity and capability within the organization which can monitor these changes. They will not automatically show up in the conventional EMIS.

External demand for change and the rule of relevance

Externally imposed demands for change complicate the process of change. Reimers (1991) shows one impact of external demands on the system: Adjustment policies of the IMF and IBRD pre-empted domestic valuing systems and rules of relevance by imposing *de facto* choices. The result has been a reordering of national educational values and hence policies and goals. This is an example of the imposition of rules of relevance drawn from other value systems. The result in this case is conflict between the two valuing systems and their rules of relevance.

There will be resistance to this imposition due to the contradictions it generates. More immediate is the resistance by local managers to the effort for establishing information systems to monitor their compliance with the imposed relevance statement and policies. It is not their choice and it contradicts all that they were taught to value! The builders of the Information System must be aware of the derivation of the demand for change. An externally imposed EMIS is likely to run parallel to the existing information structure – never the twain shall meet!

The rule of tolerances

Contemporary conditions may demand a reordering among the historical elements of the valuing system and rules of relevance. In the 1960s and 1970s educators in developing countries believed in and pursued democratization of education, access for all. Today the focus has shifted to a dominant concern with quality, a selective and elitist perspective. The responses to contemporary conditions bring to bear the rule of tolerances. The rule of tolerances sets the range of variation which will be acceptable within the application of the rules of relevance. From the 'tolerances' are derived strategies and operational objectives and procedures.

It is the elasticity of the rules of relevance which is at issue here. How far can one go in introducing into the curriculum previously 'taboo' subjects and monitoring behaviour which previously was ignored? How do you introduce participatory practice in the classroom if it was previously ruled by a 'command pedagogy'?

The lower the elasticity of the rules, the more restricted is the freedom to formulate strategies of change and to implement them. Information system builders face the same restrictions when they try to introduce new elements to an existing system. Options which lie outside of the range of accepted tolerances demand either an extension of the tolerances and/or a change in the valuing system. This calls for prior change of persons and their internal relationships rather than a change in the systems. The initial work has to show the costs of the current practices against the emergent probabilities and possibilities – and the 'benefits' of the options open to them.

The resistance deriving from the rule of tolerances usually reflects the attitudes of persons toward the consequences of change for them. Their value system (with its relevances and tolerances) is usually so historically structured that any change is difficult. Since relevance governs the development of strategies and operational procedures, this resistance is a normal bottleneck in the change process. Managers who evaluate the relevance of strategies and operations in this way (e.g., against their value system) cannot co-operate in creating and applying a new information system, even if they have to accept the policy. How elastic their tolerances are becomes the operative question.

A critical task for builders of information systems is to identify the managers most likely to be supportive. These individuals are more likely to be found among the intended users of the new system. Many will resist because the application will demand entirely new working rules, changes of behaviour and procedures at the operational level. Operators will not accept this unless there are clear signals from the top that change is wanted and will be rewarded.

Enabling and disabling the value systems and rules

Many attempts to build information systems founded upon the failure to differentiate between policies and goals that enable and those that disable existing value systems. Information systems builders need to be clear as to what they are attacking or supporting in the existing valuing system. Information systems seldom are rejected directly; it is the attack on the valuing system that is the grounds of rejection.

The systems builders are not responsible for this rejection. Without a commitment on the part of the politicians and managers of the educational system to changing the valuing system and accompanying attitudes, qualitative change will not be accepted or applied. On the other hand, EMIS builders must be prepared to learn about the valuing system and the existing rules of relevance. This provides the grounds for constructing a system.

This assumes, of course, that there is a political process and a management structure that supports and encourages learning and adaptation, and not an authoritarian leadership which imposes the old orthodoxy. If there is political support for change, increased relevance is possible. Without it, the new EMIS may only reinforce old ways. For example, a director of an education information office, on being asked why the office persists in collecting a particular class of data without ever using it, responded that it was to make people feel that they are being watched/controlled rather than a concern with performance.

The valuing system and appropriate information

An information system is appropriate when it has a high correspondence to the valuing system that underlies the information structure, the rules of relevance and the tolerances of the particular context in which it operates. This correspondence yields consistency from policy through to operations. To assume that appropriateness can be achieved by the demands of the technical logic of 'imported' systems is foolhardy. It is most difficult to imagine how one could establish a catalogue of 'appropriate indicators' which would be accepted by decision-makers if there was a lack of correspondence with their valuing system.

Insistence on high correspondence (between the information system and the value structure) poses a double bind (except in those cases where the change does not challenge the valuing system). The more correspondence is achieved, the less the likelihood of change! Advocates of educational information system development as a way to qualitative change will be forced into a corner. *First* they intervene to help the system better do what it currently is doing – system maintenance. *Second*, they help with the introduction of new elements–system innovation. The first re-inforces the *status quo* and obstacles to qualitative change. The second leads to confrontation with the valuing system in place!

The initial efforts to change will most likely result in decreased effectiveness and efficiency as persons learn to learn. The builders must work simultaneously with the information structure and the information system. EMIS development may be the tactical leader in the process, but it must be carried out with an awareness and sensitivity to possible changes in the user context.

The construction of an information system cannot change the context, only reflect it. The context will be defined by clear policy that leads to equally clear strategy, tactics and operations. This clarity provides the ground for the construction of an appropriate and acceptable information system. The leadership must publicly declare in favour of change, it must translate that declaration into policies and strategies which are clearly communicated throughout the system.

Competing theories about action and appropriateness

When 'outsiders' intervene to build or remedy information systems they confront much resistance. This reflects the suspected low correspondence between their valuing system's rules of relevance and tolerances and those of host country personnel. Simultaneously, interveners have to be aware of their own beliefs and how these relate to the beliefs of others with whom they are interacting. The appropriateness of their efforts will depend on the extent the beliefs intersect. The greater the intersection, the greater the appropriateness. To ignore the valuing system and the competing beliefs assumes that technological transfer is sufficient.

Interventionists pursuing qualitative change by manipulating the information system must recognize the extent of intersection (of beliefs) at each level of the valuing system before assuming a direct linkage between information and quality. It should also be noted that in countries where there are multiple cultures among the citizens the same problems will occur to a greater or lesser degree in the general political process. How each group views the questions of valuing and ensuing educational provision, its information system, makes for wide variation in the expectations of quality.

Information systems builders cannot assume that an EMIS can be imported, automatically accepted, and result in qualitative change. Educational system managers already have a working information structure which is serving their purposes, even if it is ineffective and inefficient. To change their purpose and the values informing it is the primary requirement for new levels of qualitative achievement. At the same time, the interveners must examine the correspondence between their 'theories in action' and those of the host. Only a synthesis of the two will result in changed behaviour. Competing beliefs must be made explicit in order to avoid the problems that come from assuming that technological transfer is sufficient.

Appropriateness and categories of change

Planning can be seen as the learning needed to resolve the competing forces (e.g., the need for continuity versus the demand for change) associated with the emerging social trends and movements to which the educational system must attend. The EMIS is the reflection of this rate of learning expressed in indicators to watch and be watched for.

The demand for change is often a demand for a new mix of the old, a new position on the same dimension of belief. Such change does not challenge the valuing system or people's ideas of relevance, but creates tension due to the manipulation of the tolerances. Accordingly, old information systems will prove useful. The learning needed to accommodate the change is a new mix of the old.

On the other hand, change may involve a shift, a movement to a new dimension in which things are radically different. Where the desired qualitative difference constitutes a shift, the entire structure of the valuing system and the rules that govern it are up for reconsideration. For example, the reform policy of Egypt aims to change the mind set of the Egyptian people. As Sourour (1991) has argued, "education which is largely a process of memorization is unacceptable in the present information age... Our young people need to develop a belief in their creative ability and the perception that they can be contributors to new knowledge and new solutions." This calls for a very radical qualitative shift in Egyptian education, a new valuing system within the society and education with all that this entails.

In this case the previous educational model and the information gathered will be of little relevance other than to indicate original disparities. The valuing and policy have changed and with them the focus of attention. This will demand new definitions of quality and the accompanying information system. It should be noted that many Third World educational systems have been trying to cope with shifts since they took responsibility for their own education. Information systems intended to address this value shift will pose radical demands for changes of values, practices and attitude within the bureaucracy. Achieving these will be a long-term effort and require constant support. A mobilization effort will be called for to ensure that all managers and teachers know the new policies, strategies and operations demanded and the value changes expected. The isolated introduction of new techniques and operations avoids the 'why' of the matter.

The dimensions supporting the valuing system

If shifts of the kinds called for in the Egyptian Reform are to be achieved it is necessary to understand further aspects of the system at work. From the valuing system emerge three dimensions which may inhibit or facilitate the information systems' contribution to changes and shifts. (i) The modes of communication; (ii) Data flows selected as relevant; and (iii) The performance standards in place, which are dynamically interdependent. They cannot be manipulated in isolation without generating further turbulence in the system.

The modes of communication consist of channels and methods for transmission and reception, their structure, organization and procedures together with their capacity and capability to carry data and information around and through the system in an accurate and timely manner.

The data flows selected as relevant constitute the sorting of experience by the valuing system and the application of 'the rules'. As the valuing system imposes the criteria of relevant-irrelevant, the data flows will correspond to these rules. These flows will indicate what the system is attending to.

The polarity of performance standards consists of the observable quantitative and qualitative outputs expressed by indicators illustrating the modes and methods of production, recruitment, selection, placement, promotion processes, and evaluation procedures employed by the educational system and accepted by the community. Each of these dimensions and their interactions are conditioned by the local context. Teaching–learning performance, for example, is bounded by the selection of candidates to be trained as teachers, their training and professional formation, the resources available to them and so forth. If communication between the teachers and the bureaucracy is limited, performance standards and data flows ignored, then quality change is almost impossible.

In some situations the information offices fail to deliver even the available limited information to the appropriate offices at a relevant time in the planning or budgeting cycles. Little attention is paid to whether or not the providers of the data understand what and why they are being asked to provide, whether or not the compilers and analysts understand the possible use and user's needs, and whether or not the potential users, politicians and managers and teachers, are actually willing and prepared to use the output, and the impact of the new information on the system and actors. In such cases the quality of education, the reform, is not impacted one whit. Persons are pleased with the development of the EMIS! What they had achieved was the automation of the old manual data collection and its descriptive reports which satisfies the historical accountability of the information directorate.

Figure 1 illustrates the valuing system and the three dimensions represented as circles. The valuing system supports the three dimensions to provide the structure for a potential, explicit information system. When the system is in dynamic equilibrium an appropriate information may be created and applied. That is, the intersection (E) of the dimensions is maximized. Since, as stated earlier, the EMIS is a 'learning system', and the informants, informed, are changed by the very information they create, the equilibrium can only be dynamic rather than static. The applicable rule is that where qualitative change is the objective, the EMIS and the managers must constantly change over time. The managers' on-going rate of learning must be greater than that which is occurring within and external to the educational system. This rate of learning must be manifested in the consequent rate of adaptation of the EMIS.

A stable EMIS is therefore a contradiction in terms. There has to be an iterative process by which learning and change is continuous and cumulative – learning, adaptation, application, change, monitor, report, learn... Even a system intended to reinforce the status quo can never be static. None of this will be achieved unless managers actually care for and about the qualitative change being pursued. The challenge facing the managers is to bring the three dimensions into a mutually supportive configuration to achieve and sustain qualitative relevance. Persons and systems need to be changed if communication, relevant data flows and performance standards are to be kept in dynamic equilibrium.

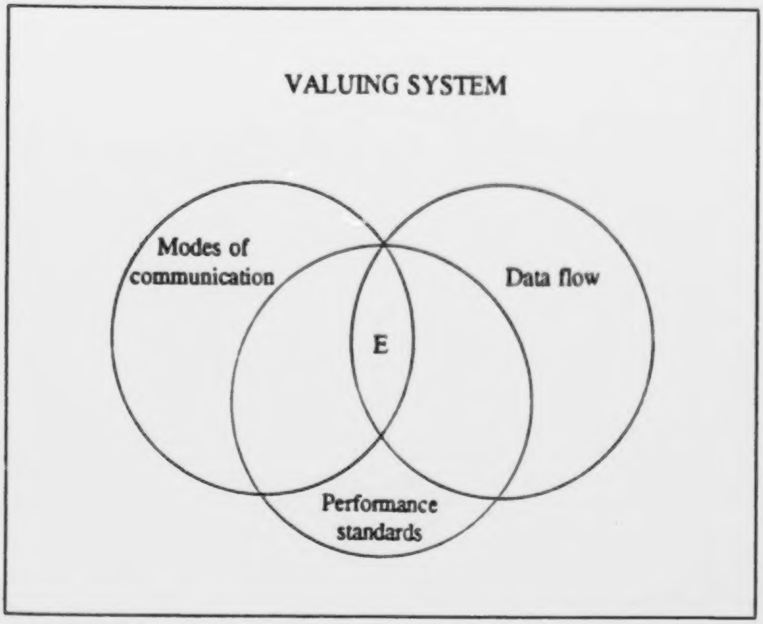
Levels of the organization and the information system

Educational systems are multi-levelled, and there is no ground to assume that these are closely articulated or directed (Welsh, 1981, 1989; Tyler,1986). This loose articulation results in significant differences in respect of the interpretation of the valuing system and accompanying rules in practice among the levels.

There are three dominant levels of action and decision making within educational systems:

- *Political level*: Policy. The global political statements of national mission and Goals. These are the long-term goal statements and are usually outcome statements.
- *Bureaucratic level*: This is manifested in strategic planning, budgeting, management and control, the bureaucratic and organizational structure, organization and processes needed to link the political to the operational level. These are the management foci of the system. These must be linked to the other ministries whose co-operation is needed by the ministry of education.
- *Operational level*: the detailed objectives that individuals and groups are expected to achieve in order to implement plans and budgets and to realize the political goals.

Figure 1. Dimensions supporting the valuing system



While it is convenient to present these as levels, it is more realistic to view them as interpenetrating strata – more of a marble cake than a layer cake. The interpenetration results from the existence and operations of 'networks' of informal connectors within the information structure which mediate the articulation. There is the headmaster who can reach the minister, the central bureaucrat who can swing a deal, the parent who can fix things, all use formal and informal networks.

As an information system is essentially about flows within the system and persons acting upon or being acted upon by these, it becomes apparent from this that there are multiple, partial routes through the system. When the 'rules' and 'levels' are further split into informal and formal, or explicit and implicit, the routes multiply. This makes the information map much more complicated and inhibits or facilitates data and information flows dependent upon the influence of the person using the system.

The central problem is that there is no universal consensus on the 'correct' and 'incorrect' routes as each of these levels are not articulated in a one–for–one correspondence. There may be serious differences among the levels with respect to valuing, relevance and tolerances. Confusion may come about because the policy has not been effectively communicated and the relevant performance standards ignored. Consider the case of the country where a policy was not publicly promulgated and the policy declaration document was treated as a 'secret'. The senior bureaucrats knew enough about its contents to be opposed to many of its aspects as impractical. The teachers did not know what was going on. The result was *confusion*. More important was the fact that the information services of the ministry of education ignored the entire matter and continued to collect the same data as before and promulgate the same reports. There was no way to gauge the reform policy! The prerequisite of an effective EMIS is clean, clear communications where persons are actively encouraged and rewarded for learning and disseminating and applying that learning.

Levels are steeply pyramidal

There are two further aspects of interaction of the levels and the information system. *First*, the structure of the system is a steep, pyramidal hierarchy. At the base there are as many actors, formal and informal, as there are families participating in the educational system. The number diminishes as we move up the levels of teachers to policy advisers and the minister. Each upward movement compresses and diminishes data flows, reduces the robustness and leads to intensified refinement and sorting. This is reinforced by the different interpretations of relevance and tolerances which are applied at each of the 'network' layers where the decisions of relevant-irrelevant, practical-impractical, operable–inoperable are made. Values are increasingly obfuscated as one ascends.

On the downward flow there is expansion, elaboration and interpretation. At each of the changes of level there is a reformulation of the 'message', a massaging directed to sustaining relationships by mitigating the 'harshness' of the instruction. There is an understandable wish to retain good working relationships and linkages to the surrounding levels. Few like to deliver 'bad news'. What goes up does not come down. What is sent down is not what arrives!

The design of the EMIS must incorporate decisions as to which information must remain at each level and which must pass to another level. For example, the teacher needs to know and retain the detailed performance achievement of each child in each subject area. The region in turn needs to know the comparative performance of its schools in each subject area. The national ministry requires to know the comparative performance of the regions. There is little to be gained by insisting that all the classroom and regional school performance data flows to the centre. This retention by level of the data and information relevant to its planning and management needs will 'flatten' the pyramid by creating a more effective and distributed line management system. This flattening of the system is, perhaps, the most feared consequence by 'senior' staff.

Layers, communication and policy acceptance

The network layers act most strenuously on communication. It also has implications for the belief long held by planners that there is a necessary connection between policy and operations. The reformulation of policy which allows it to pass through each level and to be accepted at the next progressively brings it closer to the *status quo*. Policy does not travel well in educational systems due to the lack of clean, clear communications backed by suitable performance standards which are monitored and applied.

Educational systems are more akin to 'cottage industries', rather than the industrial models which inform MIS models. This is an attribute of educational systems which has been long overlooked but is increasingly confirmed by the evidence of school improvement programmes where the roles of the teachers and headmaster have a shared approach to the life of the school. Schools vary by staff as much as by students.

This is reinforced by a similar process occurring in the processing of information. Persons act upon the data and information in the light of their view of the value system in place and the implication of changes for them. At the same time, the information acts upon them to the extent that it makes them more or less defensive or supportive. Consequently they will seek to manage information flows. In the descending case the 'formal' information system is set aside and the informal becomes more influential. This frequently results in the 'network layers' becoming the generative and sustaining elements of the system, even when they act contrary to declared policy. Each school, each cottage, produces its product to a quality level according to its capacities, capabilities and inputs but this is generally evaluated against the 'desired' quality of the wholesaler, the Ministry of Education. There is both competition and confusion over 'relevance' definitions.

Levels are desynchronous

A *second* aspect of the interaction of the layers which must be addressed is that each has a different 'reaction time'. The layers are desynchronous. This is similar to the first mate of a super tanker turning the wheel on the bridge, which he can do with ease. By the time this message reaches the rudder and the ship begins to respond they have travelled a considerable distance on the original course! Information systems that assume a synchronized response capability and capacity ignore the inertia of the system. This poses questions as to when particular categories and classes of information have to be collected and disseminated to ensure maximum synchronization of effect. The declaration and then implementation of a policy to shift teaching practices from rote learning to creative participation will take much longer than the normal tenure of the minister who promulgated it. There will be a new first mate on the bridge when the educational tanker turns and he will probably lay another course!

Establishing the communication system, the relevant data flows and the performance standards indicators and rewards manifest in an information system demand different time frames. Implementing them in practice will take even longer. By the time there is sufficient shift in the classrooms to begin to measure the movement toward policy implementation many years will have passed! The decision to introduce a new subject to the curriculum and achieve acceptable standards of performance will require at least the time taken to prepare the syllabus, train teachers, produce teaching and learning materials and implement an assessment system. This would be compounded by putting in place a monitoring system capable of yielding relevant formative evaluation. Viewed from this perspective any information system must be time and synchronization sensitive or it is 'inappropriate'. The time scales of the effects of information system and their variations at each level are not a well studied domain, but it is here that the link of information and change of quality will be most effected. A tentative rule may be: Building an information system requires the formulation of both a strategy and tactics to reduce the number of redundant linkages in the system and accelerate the rate of communication and adaptation.

Pathological systems frustrate information systems

This section looks at how existing information systems can come into being and be pathological from day one. That is, how EMISs will have an inherent tendency to irrelevance.

First, a dominant individual can impose a definition and application of the three polarities before which all others defer – this is how I want the system to work! This is typical of administered educational systems. It is most unlikely that a person could impose a valuing system, but a mode of practice can be established where questions of value-quality are avoided. We may imagine a minister who is seen as the sole repository of 'wisdom' in respect of communications, relevant data flows and performance standards. He/she is most likely to run into problems stemming from the valuing system, rules of relevance and tolerances in place. Calling upon foreign expertise to assist him/her to define and implement reforms brings with it the competing theories in action and resistance. Reforming ministers tend to confuse their influence on the dimensions with their capacity and capability to shift the elements of the valuing system that block the way to the desired performance of the system. Too often we witness reforming ministers running foul of parental opposition to change due to the facts that the parents value the education which they themselves received. This is what usually happens with the aspiration 'to change the organizational culture'. It is seldom appreciated that this is a call to change valuing systems and not a dimensions change. It is a shift rather than a change. Information systems and their usage will change exceedingly slowly, if at all, in such a situation. The information structure and information system will be on divergent courses.

This competition results in a 'minimalist' system with decreasing efficiency and effectiveness where persons bear the imposition of polarity manipulation by settling for the minimum response which can keep the minister and their immediate supervisors happy and themselves safe. Marginal changes, maintenance training, are initiated. The more adventuresome resistors may try to overload the minister by pushing all choices and decisions upstairs to gain a measure of restrictive control from bottom. They destroy the communications system by jamming it. The resistors are likely to win; there is often rapid turnover of education ministers. The pursuit of qualitative change is submerged in internal bureaucratic politics.

Second, a dominant group which has the power and authority to decide what is acceptable-unacceptable, operable-inoperable, can impose its valuing system. It is important to note that the dominant group which calls for the shift of the system need not be domestic. In Third World settings the call can emanate from 'aid' agencies as a condition for assistance. Adjustment programmes carry such demands.

Whatever the source, the result is a clash between the imposed valuing system, the ensuing information demands and the on-going application of the old rules of relevance and tolerances and the workings of the dimensions. This is usually manifested in calls for changes in attitudes. Tanzania after independence is a good illustration of imposition of a valuing system by the political leadership. The consequence is that the dominant group's valuing system confronts and tries to suppress the competing system. The common outcome in this case is the emergence of 'contra-networks' within the system which use their control of the polarities to inhibit the dominant group's efforts. The result is a diversion of organizational energy into tactics of facilitation and inhibition of change that divide the organization. The age, attitudes and structure of the staff combined with entrenched historical conditions and expectations turn this into a long drawn out battle with uncertain results. The dominant group resists change and rejects learning, the 'progressives' insist upon change according to their learning which has been rejected by the dominant group! Progressives, in such cases, are reactionary. Neither group learns much but competes over prescriptions and who should apply them.

Shifting the information structure lies at the heart of this struggle. It is a battle about the definition, control and direction of the information structure and system to shift the values reflected in the educational system. The educational system becomes a metaphor for the struggle over the value system which will direct and develop society. The construction of an EMIS is a major strategical thrust in such a struggle. It cannot be viewed merely as a technical improvement. 'Power grows out of the Central Processor!'

Third, the system has a dominant 'common sense' in place which overwhelms all alternative points of view. It actually excludes whole areas of learning. It is divided into 'the thought, the unthought and the unthinkable'. The world is flat, the universe singing spheres! 'That's the way our system works!' 'This is the way your system should work!' The 'common sense' is so established that it is beyond open questioning and is deemed immutable – it is the one true way. Even those who apprehend the deficiencies believe the system to be unassailable and petulantly conform to it.

In conditions of economic growth and political stability the 'common sense' is most entrenched. When economic and political conditions deteriorate, 'deficiencies' may be openly declared as they become self-evident and assertive. This shift of common sense' is reflected in the practice that when 'adjustment policies' are imposed they are accompanied by calls for new information structures and management systems. This very 'common sense' is the disease which defeats all efforts to change. At worst it rejects all other forms of knowledge as mere 'opinion', and hard reliable facts are defined by the 'common sense'.

Systems builders who are intent upon qualitative change must grapple with the question of where and by what was the existing system created and what gives rise to the current demands for change. Where there is an educational system subject to individual dominance, then educating or changing the minister and the most senior civil servants is more likely to give good results than embarking upon messing about with the data collection and analysis.

Where there is group dominance, the primary task is to demonstrate the consequences of their taboos and refusal to learn and adapt. These taboo areas are most likely to be what is accelerating the system into irrelevance. We cannot change the rules of promotion and payments. At the same time they are likely to be just the very places where the 'new' is needed. For example, where the law declares all education to be 'free' and the economy is declining, it would be better to show ways to get new revenue. With an entrenched 'common sense' there may be no option but to wait until the contradictions make themselves so transparent that the result is of such irrelevance and instability that change is imposed. In times of prosperity and stability entrenched common sense is almost impossible to question.

Regretfully the evidence suggests that we do not know how to change the common sense on a large scale and in a way that penetrates the educational system from the policy to the operational levels. The current fixity with 'efficiency' and the cost aspects of data flows illustrate this partial address of radical decline. Resource deficiencies are not the problem. In fact, increasing the resource availability may simply put off the day of reckoning. Budgets are merely financial expressions of goals. Without prior clarity of purpose this can be throwing good money after bad! Educational systems are dictated in great part by their initial conditions of establishment and, until these initial conditions are deciphered, new systems will cause confusion.

The consequences of pathological systems

These three pathological modes of grounding the information system – *dominant individual, dominant group, common sense* – are essentially limited and will consequently result in the decline of the system. Each is intended to make the information system be an early warning system telling them what is going well or badly with the systems from their perspective and interests. As early warning systems they are reactive. Their internal limitations and reactive nature lead to decreasing attention to relevance and shifts of tolerance – to calls for changes in mission statements, goals, objectives and operational practices.

Builders of information systems must create ways by which the systems become early learning systems. Not only will there be a need to create the information system as defined earlier, but this must be accompanied by the creation of an internal unit which monitors and studies the system in practice and informs the very information system about its own relevance and performance and the nature of the evolving information structure.

If you do not know what you want and where you are going, it is still possible to collect data and analyze it to death and promulgate the resulting reports. You can do the wrong thing very well! Qualitative change *via* information systems assumes that a great deal of prior understanding of the current system is in place, and that there is a realistic potential for change or shift within the bureaucracy. Most central is the assumption that the value system informing the provision of education has the capacity to change and absorb different values and rules of relevance and tolerances which will be reflected in new practices and new modes of monitoring performance. There may come a time where systems builders have to say that there is little point in persisting in their efforts as the current valuing system lacks the attributes needed to evolve.

Information systems as early learning systems

The creation of an information system which is an early learning system operated by learners, depends upon whether or not the valuing system contains and pursues those values which encourage learning and adaptation. If the ministry of education and the society does not value learning and adaptation, it will not pursue it. If the rules of relevance and tolerance being applied are also deficient in respect of the desired practices, then there must be an overhaul before building information systems. For example, top down communication patterns negate information systems. Management information systems presume that the organization is managed and that the management function is distributed and exercised throughout the system. If this does not exist and is opposed in practice then there is little point in trying to link information systems to qualitative change until institutional and organizational change is addressed and folded into the process of information system development.

Conclusion

While pathological systems abound, the system builders still need to face the fact that there will always be a system in place. In the short term the 'valuing system' is articulated in the 'manifestos' of political parties and governments which then are articulated in the 'policies' of ministers. These in turn are translated into strategic and operational plans, programmes and projects by bureaucrats and school staff. In the absence of defined policies which are clearly communicated and accompanied by performance and standards indicators, and monitoring and reporting systems, there can be no effective performance demands and no effective information systems. Clearly formulated and communicated policy is the touchstone of any information system. Without it there is no way to sort the desirable from the undesirable.

Systems builders provide an information system which will serve the declared policy. They should not, however, assume that the existence of an information system (a new data collection and transformation process) will change behaviour. Organizational development, management training and so forth must accompany this effort. All three polarities, *communication, data relevance, performance standards*, must be addressed simultaneously and at each level of the system.

The thrust has to be to change the system from being an 'early warning system' to becoming an 'early learning system'. This can only be achieved when the workers in the system are encouraged and rewarded for learning and adapting faster than the internal and external rates of change rather than reporting and conforming. This means that any information system, insofar as it emerges from the ground of the valuing system *via* the three polarities, must have the capacity and capability to inform the system through all levels of the organic changes needed to sustain relevance.

The system must be able to learn about itself. You need to pay attention not only to both the products and the tools, but also to the very cast of mind informing the system. When a particular goal is not being achieved, it is necessary to ask if it is the result of an obstacle within the attributes and applications of the valuing system and dimensions, or is it merely a lack of information about what to do.

In some systems the flow of the data from the schools to the centre is not accompanied by any return of processed information to the schools. The net result is, at best, an annual statistical description of the system which is generally ignored by those responsible for policy, planning and operations.

Information systems builders must pay attention to the implication of the network layers. It is unrealistic to assume that an information system can be formulated and put in place which will be acted upon by 'the decision-makers' without extensive institutional and organizational development efforts. These efforts should be accompanied by significant pedagogical initiatives to support the change on 'the shop floor', that is, in offices, schools and classrooms. Each level has its own set of decision-makers. For each level the builder must simultaneously attend to: (i) the valuing system; (ii) the organizational and institutional development needed by information providers and users; (iii) the polarities of communication, relevant data flows, performance and how they will be changed to support the evolution and application of the information system; (iv) the interactions between and within the levels and the variations in response rates; (v) the pyramidal hierarchical structure with its mediating layers of 'unstructured' relationships; and, (vi) external relationships and dependencies.

Appropriateness, sustainability and qualitative change will depend upon how comprehensively and carefully these matters are handled. Embarking upon such work, the above suggests three aspects should be considered: (i) an *information analysis strategy* to ascertain what exists and how it works from the foundation of the valuing system to the details of reports issued, to identify deficits and deficiencies and link these to the declared needs of the persons in the system; (ii) a *communication strategy* for mobilization, design and implementation, dissemination and application; and (iii) a *formulation, design and testing strategy* for a comprehensive address of the system which cannot be done by the advance of a single column of EMIS builders. There is a need for a broad front advance addressing organizational development, management, administration, training and so forth.

At the heart of the pursuit of qualitative change lies the challenge of reorienting the valuing system. From the ground of the valuing system evolves all of the attributes which shape and direct the information structure and its supporting information systems. These in turn shape the perceptions and choices as to what is relevant educational provision. Understanding these attributes and their dynamic interdependence as revealed in the behaviour of the participants in the system is the first step toward providing a sustainable and relevant quality of education.

Each child entering school has the right not only to acquire knowledge, skills and the development of aptitudes, but also to receive the most appropriate guidance to a fruitful future where she can provide for herself and make a contribution to community. This is the quality which information systems must help to achieve.

Little of this can be achieved unless education systems accept that learning, teaching and application become attributes throughout the system and not be limited to the classroom. For the educational management information system to effectively and efficiently contribute to creating the bridge which *links management to quality products* the operators throughout the system must be encouraged and rewarded for being early learners.

This chapter is an initial attempt to identify those elements which must be attended to by the bridge builders.

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Part III
Country studies

Chapter 6

The use of national assessments to improve primary education in Chile

Ernesto Schiefelbein[1]
UNESCO Regional Office for Education in Latin America and the Caribbean (OREALC), Santiago

Introduction

Although *three national assessments* of student achievement have been undertaken in Chile in the last 20 years as a basis for improving educational quality, these efforts have neither generated the expected increments in students' achievement nor increased equity among students from different socio-economic groups. This chapter describes the aims, design, operation, and impact of the three programmes. A major finding was the remarkable stability in fourth graders' achievement scores over this time, interpreted by some as evidence of stagnation of the education system. This case study explores possible causes of such stability, suggests improvements in the use of test results, and examines the appropriateness of analyses that were used in making comparisons between groups of schools and across years.

First national assessment of learning among eighth graders, 1968-1971

The first national assessment of learning in basic education was carried out in 1968 among eighth graders and had three objectives:

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[1] Joaquin Morales Frias (CPEIP) assisted in the description of SIMCE and in tabulating main results. Cesar Rimassa and Liliana Sanchez (Ministry of Education) gathered relevant information on the use of assessment results at the school level. E. Himmel provided additional information that filled several gaps and debugged the first draft. The comments made by E. Himmel and L. Mählck were extremely helpful for preparing the present version.

(i) to monitor the impact on quality of the massive education reform launched in 1965, (ii) to make sure that teachers were teaching higher order intellectual skills (beyond rote memorization) by using the 'backwash' effect of the test, and (iii) to identify differences on quality of education delivered to students from different socio-economic levels. Eventually, a fourth objective was added in 1970: to assess the impact of key educational inputs on educational achievements.

As part of an effort to increase the quality of education, a series of changes to both the inputs and processes of education were initiated in Chile as part of a national reform in 1965. In spite of apparent successes of this reform in improving educational inputs, the education authorities, in 1967, decided to monitor the impact of those inputs on quality in a more systematic way. Authorities were aware that some of the changes implemented under the reform were based on thin evidence of their probable impact on student achievement. For example, teachers were upgraded in short seminars; primary schools were gradually expanding from six to eight grades; new curricula were being tested, revised and then implemented in two additional grades each year; new textbooks were being tested, revised and then implemented; space and facilities had been expanded to enrol all children demanding access to primary school; and repetition was reduced through remedial coaching and by passing students according to a minimum percentage of school days attended (Schiefelbein, 1975). Although important, those changes in inputs were only part of the solution. Education authorities wanted to change the way education was delivered such that students would be 'learning-to-learn'. This goal required a substantial change in the way teachers teach. One strategy was to use the eighth grade examination (P8G) as a means of influencing basic education similar to how the university entrance examination was used to shape teaching in high schools (e.g. the backwash effect).

At the end of the 1968 school year the Ministry of Education (MOE) administered a nationwide test covering all eighth grade students (104,000) in the country. The P8G test was designed and tested by using the local expertise developed in the Statistical Research Institute of the University of Chile. The objectives of the P8G test was intended to test all the reformed curriculum objectives in Spanish and mathematics that could be measured in an objective test format (accepting that many schools would not cover all the objectives of the reform, at that time). A committee formed by teachers and researchers identified items for each objective in each topic area. Each item was analyzed in terms of its correspondence with the objective and the adequacy of style and distractors. Through consensus, items were rejected when they were judged inadequate on these two criteria. Finally, items were tested in a pilot study of 2,500 students. Each item was evaluated by its difficulty level, though items measuring higher order thinking were included in spite of being answered by low percentages of students (in order to show teachers the desired outputs).

Wide publicity about the importance of measuring learning and the low weight assigned these scores in determining admission to secondary education were instrumental in reducing teacher resistance and increasing students' interest in maximizing their scores. Sample questionnaires were widely distributed during 1968 and 1969 in order to familiarize students with test-taking skills. Mass media co-operated by broadcasts announcing that the test would be used to certify that students had completed the first level of education and explaining the minimal role these tests would have in secondary school admission. As an incentive to schools, teachers received a report with their students' scores and the average class score.

Test results were the basis of a major 1970 study on the determinants of educational quality (Schiefelbein ; Farrell, 1972, 1982). For the first time a developing country was able to replicate the seminal study conducted by Coleman in 1966 in the USA which examined the relative contribution of home and schooling to student achievement.

The 1970 study showed that the investment in textbooks[2] and nutrition were highly worthwhile, but teacher upgrading and reduction of class size did not contribute to raising student achievement (Farrell ; Schiefelbein, 1982). The study also showed that schooling was not able to compensate for differences in students' achievement due to differences in family socio-economic level. The study opened new ways to think about reallocation of resources for improving quality of education (Schiefelbein ; Farrell, 1974). A more ambitious analysis was planned for the next year, but a new party came into power. The last P8G was administered in 1971.

Measuring learning to help customers to make options, 1982-1984

Although the second national assessment was initially designed as a tool for shaping central policy formulation, it ended up serving as a source of information for parents to make decisions about where to send their children to study and for supervisors and local officials to select where to improve school performance. In 1978 the MOE commissioned a team from the Universidad Catolica to develop a system to assess the quality of education, focusing on factors that influenced educational achievement. The team explored several alternatives including comparisons of sampling versus universe, and of testing one or several grades. Pilot studies conducted in 1980 were used to estimate costs of each of the alternatives. (Himmel; Maltes ; Majluf, 1982). At the same time there was a transfer of public schools to the counties (municipalides). The government (and a new minister) was interested in introducing a market approach as a means of improving education and wanted to provide parents and students with information they would need in selecting their best options. All fourth and eighth grade students living in urban areas of Chile were selected for the national assessment 'Programa del Rendimiento Escolar (PER)'.

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[2] Professor C. Arnold Anderson suggested including the question on textbooks. The positive impact detected in this study was quoted in the World Bank Report on Education, 1972 and used to support the bank policy on lending for textbooks.

The PER assessment was launched under two assumptions: (i) if information on the weak aspects of teaching were made available, teachers would be able to improve the teaching of those aspects, and (ii) parents would be able to move their children to other schools if teachers were not responsive to the information on problems. Since students living in small towns and rural areas (where there is only a single school) had no options, they were excluded from the assessment. There was a strong emphasis on providing feedback directly to teachers, schools and districts and on informing the public about the assessment programme.

In 1981 the MOE contracted with the Universidad Catolica for the technical and administrative work and, over time, a first level professional team was formed. From 1982 to 1984 a series of tests was administered to nearly 400,000 fourth and eighth grade students (80 per cent of the enrolment in those grades) in 3,200 schools (40 per cent of the total number of schools). The tests provided information on cognitive achievement in reading, mathematics, science, and social sciences and was summarized and reported at the classroom level. The results were used to inform parents and supervisors about achievement levels on a school-by-school basis.

In spite of the excellent technical quality of the tests, safe administration procedures, and timely dissemination of results, the PER only lasted three years. The new minister appointed in 1983 threatened to punish schools for poor test results, generating resistance to PER from teachers and principals. Critics argued that spending over US$.1 million per year in the PER was too much relative to possible benefits. Some officials at the MOE also argued that they had no access to magnetic tapes with the PER data for further analysis and had to rely only on published figures (CPEIP, 1983) [though the University team co-operated in a reanalysis of the data requested by the Ministry of Education (Guida, 1984)]. Late that year a new minister was appointed, but he ignored the PER problems and possibilities. In 1984 another minister was appointed and quickly announced that the PER programmed for that year would be the last one and ended the contract with Universidad Catolica.

The short life of this programme did not allow an evaluation of the two main assumptions behind the programme. While there was some mobility of students from municipal schools to private subsidized schools, it was impossible to evaluate teachers' response to the PER results and their ability to raise students' achievement levels.

In summary, because too many ministers dealt with PER, the MOE never really considered PER as a tool they could use, even though the information reached the supervisors and some corrective work was carried out at that level. No high official asked any further analysis of the PER information, even though specific additional analyses were suggested in reports prepared in the Teachers' Upgrading and Research Centre (CPEIP) (CPEIP, 1983). CPEIP, a MOE unit, was interested in identifying factors that could be used to improve the quality of basic education and to organize on-the-job training of teachers. Shortly after PER ended its work, CPEIP organized a research group (SECE) and a one test application was administered to 9,300 eighth grade students in 300 schools in 1986. Due to a weak infrastructure and limited resources the SECE group also had a very short life.

Measuring quality for accountability, 1988-1991

The new minister appointed in 1988, facing new demands and needing better information (he was an engineer), created a new assessment system (Sistema de Medicion de la Calidad de la Educacion, SIMCE). At that time, responsibility for schools already had been transferred to the counties and the MOE was searching for a new role. Evidence that education quality remained stagnant was offered in support of a renewed MOE role in quality improvement. It was proposed that the new SIMCE, managed once again by the Universidad Catolica, should help the MOE hold schools accountable for learning outcomes. SIMCE was to assist the MOE in its normative work and in its supervision of the system. As part of this, the SIMCE was to assess quality in each educational institution, compare those results across schools, identify explanatory factors to account for performance differences among schools, and evaluate the results of educational programmes aimed at improving quality. In order to meet these ambitious goals SIMCE gathered similar information to that of PER, but added new indicators identified by SECE: (i) opinions of teachers, parents and students on the quality of education,

(ii) personality development, and (iii) internal efficiency indicators, such as promotion rates and years enrolled at school.

SIMCE focused on grades 4 and 8 (the same population targeted by PER), but administered a test in each grade every other year, thus cutting the administration costs of the assessment by half. However, coverage of each assessment was substantially expanded. Since one goal was improved school-based management, every school needed the information in order to make corrections that would yield better performance. In 1988, achievement tests were administered to 233,000 fourth graders (90 per cent of the total enrolment in that grade) in 5,600 schools (70 per cent of the total number of schools). A year later, in 1989, the tests were given to 193,000 eighth graders in 4,600 schools. More students and the majority of schools were included in SIMCE in comparison to PER, because SIMCE involved schools that were more isolated and difficult to reach.

The lack of time in 1988 to design a new test for measuring grade 4 was a fortunate event in that it allowed for comparisons between SIMCE and PER results. The first SIMCE test used the same type of items as PER, the draft version was tried out on the same type of sample used by PER, and the results were reported for the same types of groups used in PER. Therefore, it was possible to compare SIMCE results for that grade with previous PER results. Unfortunately, starting in 1989 a new sample was used for the pilot testing and the information is now reported for groups generated with new definitions.

Types of testing agencies and staff development

Though the three programmes described above required strong implementation efforts, they were carried out through quite different organizational arrangements. The P8G (1967-1971) was implemented through a MOE unit (Servicio Nacional de Evaluacion, SNE) especially created to carry out the programme. The SNE worked with CPEIP on item identification and instrument design through committees of subject specialist. Field testing was organized by SNE with advice from the Statistical Research Institute of the University of Chile, which also advised on the tabulation of results.

PER (1982-1984) was contracted as a whole package with a non-profit private university. The university selected from its academic staff experts competent in measurement and analysis who used the university's computing facilities for scoring and processing the answer sheets. An external network of people (including many university students) was organized for the administration of the questionnaires.

SIMCE was launched in 1988 as a joint MOE-Universidad Catolica effort that was eventually transferred to the MOE in 1991. The position of SIMCE as an official unit of the Ministry of Education has only recently been clarified and much of the technical expertise to operate SIMCE still resides within the Universidad Catolica. Furthermore, the functions of SIMCE are now being redefined as part of a large project funded by the World Bank that includes a complex management information system being implemented as part of strengthening the Ministry of Education management capacity. It was expected that SIMCE should eventually provide quality indicators to be included in the routine decision-making process of the MOE.

These three organizational arrangements for implementing assessment programmes did not include research as a built-in part of the assessment process. Research carried out with P8G and PER results have been due to the personal interest of researchers rather than in response to an expressed need of decision-makers at the Ministry of Education (see Schiefelbein ; Farrell, 1982). Therefore, very little useful information about the inputs to schooling is collected along with the achievement scores. Consequently, the government is not in a position to fully exploit the potential of its achievement data for policy-making purposes. The MOE has no basis for singling out or encouraging the 'best practice' or 'best technology', because it lacks the necessary information.

The technical staff of SIMCE includes educators (academics and practitioners), psychologists (including test oriented specialists), and system engineers, but no one with doctoral training in psychometrics. The design of assessment instruments is mainly carried out by educators and psychologists, while the administration of the assessment and the processing of the answer sheets is carried out by the engineers and correspond to about 90 per cent of the total cost of the assessment. In late 1990 the staff included 15 specialists (in full-time equivalents, FTE) organized in five groups:

(i) The group developing cognitive items and in charge of the item analysis of pilot test results consisted of educators, psychologist, a testing specialist, and part-time teachers who served on subject area committees. (Ad hoc groups that generated additional tests are not included in this estimate.)

(ii) Those responsible for management and logistics, including printing and transportation of materials, included two FTE system engineers .

(iii) Staff in data processing included two system engineers.

(iv) Those in charge of field administration of the instruments, dissemination and operation of the on-line computerized network included two system engineers and two secretaries, with 725 supervisors and 9,000 enumerators participating during field administration of the instruments.

(v) Those responsible for co-ordination of the technical assistance included one director-manager (system engineer); one acting director on test design (educator-psychologist); and one acting director of administration of field work (system engineer). This team was made of university professors.

The transition of the SIMCE team to the MOE opens questions about the ability of MOE (given its salary scale) to retain a staff with a high level of managerial capacity and technical qualifications. The support of MOE for SIMCE is unquestioned, but the civil service career salary scale is limited in its ability to compete with the private sector for high level personnel. Furthermore, 13 members of the staff (described above) are paid by Universidad Catolica and probably would not want to transfer to the MOE but, rather, to be reassigned within the university. Therefore, the precise relationship between the Ministry of Education and the University needs careful attention.

The cost of operating SIMCE

With a total annual of cost over US$.1 million, US$.5 per student, the cost of SIMCE represents about 0.3 per cent of the MOE's budget for primary education and 3 per cent of the unit cost of educating a student. Some 60 per cent of the total cost of SIMCE is for instrument design and analysis; 40 per cent is spent administering the assessment, including training of enumerators who do the actual test administration (*Table 1*). The unit cost of SIMCE is one-fourth of the amount students pay for taking the University Entrance Examination Test. The total cost increases to US$1.6 million and the unit cost to US$.7 per student if time spent by supervisors is included. The 748 supervisors spend about two months in planning and participate in the administration of the test and the diffusion of results. With an estimated monthly salary of US$.300 the work of supervisors represents an additional cost of US$.450,000 per year.

The total cost of SIMCE depends on number of staff involved, past experience, and the number of schools and students tested. However, nearly half of the total cost is fixed, the cost changes vary little with the number of students tested within a school. Furthermore, as more people have the necessary training in test design, as more items are already available from past assessments, and as more computer programs to analyze the data are already available, less time will be required for those activities, resulting in lower costs to develop new test instruments.

While the marginal cost of including additional students in each school is low (and the marginal benefits high in terms of research possibilities), the cost of field administration of tests varies according to the number of schools. Moreover, the more isolated a school is from the main roads the higher the cost of including it in the testing.

Table 1. Estimated operation expenses of SIMCE, 1990

	US$	US$
Professional fees for managing the system	235 000	
Design and field test the assessment instrument	40 000	
Printing (draft and final) examination booklets	100 000	
Packing, transporting, and delivering booklets	40 000	
Optical reading and processing filled sheets	65 000	
Output (printing) with scores for users all levels	25 000	
Scoring essays in writing (includes training scorers)	20 000	
Disseminating results and holding local meetings	40 000	
Other general expenses	35 000	
Sub-total		*600 000*
Development and printing of new tests	160 000	
Salaries and training of enumerators for field work	265 000	
Other expenses for test administration	135 000	
Overall co-ordination	40 000	
Sub-total		*600 000*
Total operation expenses on SIMCE in 1990		1 200 000

Source: Ministry of Education, Budget estimates, Santiago, 1991.

These elements must be taken into account when analyzing the cost structure of the assessment. The distribution of costs is estimated to be approximately 50 per cent for the contract to run SIMCE (design tests, print booklets, process filled sheets, print outputs and disseminate results), 33 per cent for operation of the field administration network (including salaries of enumerators and training), 12 per cent for the prototypes of new tests of personal development and value judgments on the educational quality, and 5 per cent for the co-ordination of SIMCE in MOE and other expenses.

Unit costs of SIMCE are less than half the unit costs of PER, given that PER tested students in both grades 4 and 8 each year while SIMCE tested students in each grade every other year. In addition, the new contract with the University does not include the operation of the field administration network. These two changes have reduced the amount of the contract to run SIMCE to about 30 per cent of the contract to run PER. Therefore, one basis for criticizing the amount of the contract has been drastically reduced. Furthermore, the transfer of the field administration network to the MOE has increased the commitment of the Ministry of Education staff to SIMCE, improved the relationships with supervisors, and helped the acceptance of SIMCE measurement at the school level.

Designing the instruments and administering the assessment

The design of instruments has been consistent with the goals above described for PER and SIMCE. Both programmes used criterion referenced achievement tests with a multiple choice item format. These multiple choice items presented three alternatives in grade 4 and four alternatives in grade 8, though a few open-ended questions were included to test writing ability. Items were evaluated in terms of their difficulty and were accepted if they were correctly answered by at least 30 per cent of the students. Items that were not answered by at least 10 per cent of the students were dropped from the final selection. The KR20 reliability of the final forms exceeded .90. When possible, distractors were designed to help identify types of mistakes students made when answering the questions.

In spite of this care in test design, some further work is required, since it appears that in PER-82 the Spanish and mathematics tests were measuring similar cognitive traits (Guida, 1984). A high correlation was detected between achievement scores in Spanish and mathematics when using the school as the unit of analysis (.88 in 2,500 eighth grade courses and .93 in 2,934 fourth grade courses). (The data were not available at the level of the student.) Also, the correlations between achievement in Spanish, social sciences and science were high. These high correlations suggest the tests are measuring aptitude rather than achievement. No specific changes have been introduced in item generation, nor has this analysis been replicated for SIMCE. Therefore, until better tests are developed, resources spent in testing additional students should be reallocated to further analysis of the data already collected.

Each year some 200 new items are added to an item pool from which the SIMCE examinations are eventually composed. All those items are tested in a pilot study of 3,500 students who finished grades 4 and 8 the previous year. Each item is answered by 350 students in order to evaluate the item (as described above). At present, there is an item bank of 1,000 items in Spanish and a similar one in mathematics. Eventually, with about 2,000 items per subject, these items could be published (to assist students in preparing for the test) with the intention of including many of these published items in the actual test.

Each test is administered to a sample of students on the same day throughout the country and all tests are administered in two days with a reasonable level of security. (Two parallel formats are assembled for each test in order to reduce cheating.) For social sciences and science a stratified random sample of 10 per cent of the students was selected. The writing test was administered to all students, though only a 10 per cent random sample was corrected and analyzed. The field work lasts a week and all Direcciones Provinciales participate in the process with collaboration of supervisors (748) and test monitors (9,000) hired among school teachers (university students were hired in the past).

Even though the PER and SIMCE assessment results were not used for certifying students' performance (this is a difference with respect to P8G), students seemed to be diligent in answering the questions. Practically all items were answered and teachers tried to motivate their students to get as high a class (or school) average as possible. Further, county (municipio) and private schools used these results in competing for students. Therefore, it has been easy to motivate teachers to encourage student attendance on testing days and maximum effort in completing the tests.

Processing the information and disseminating the results

In PER and SIMCE the Universidad Catolica successfully analyzed and reported the test data. Data were quickly validated and processed, and printouts distributed at the school, county and regional levels. Optical scanners at the Universidad Catolica were used to score the multiple choice tests. The results of the writing scores were added to form total test scores. Information was then validated (to make sure that answers were within the expected ranges), results were printed out, packed with manuals with instructions for interpreting results, labelled, and sent to their final destination, all within about one month from the time the students took the examination. Printed results included the percentage of correct answers by item for the school, a comparison of the school with other schools of similar background in the same region, and national averages.

Results by school have never been made public and the class has been the unit of analysis for results sent to schools. No results by student have been distributed to schools. Only a 10 per cent random sample of the students' writing essays has been corrected. This is a potentially cost-effective approach to the high cost of correcting open-ended questions.

Dissemination meetings were held with principals and teachers, during which comments on the results were distributed (Himmel, 1986). A manual on pedagogical implication of the tests was prepared for the 1984 and 1988 applications (EquipoPER-1984, EquipoSIMCE-1989), though no specific suggestions on techniques for improved instruction (to help students to avoid the types of errors they usually made) were provided as it was done in Kenya (Somerset, 1987). Dissemination meetings in 1982 and 1983 were attended by two teachers per school, though many more teachers had participated in the initial diffusion of the goals and characteristics of PER. Twenty thousand manuals describing pedagogical implications of the 1984 test were printed and were distributed mainly to teachers attending meetings. Audiovisual materials were also used in those meetings.

Background information was used only to present schools results controlled by three variables: socio-economic levels (three levels in PER and four in SIMCE), urbanization levels (metropolitan area, large cities, and small cities in PER, and the same plus the rural area in SIMCE), and type of school (private, private subsidized and municipal). No multivariate analysis was conducted with background information as part of the standard analysis of the achievement data. However, individual researchers have employed multivariate analyses with specific sub-sets of data as part of their personal research agendas.

Uses of the educational assessment at the school level

Teachers, principals, supervisors and regional officials report a fair amount of direct use of the results from PER and SIMCE at the school level, but there are differences of opinion about levels of use. There may be some additional indirect effects from system-wide analyses that were conducted (reported in the next section), but those effects are too difficult to track down and no information from potential users is available.

About 80 per cent of principals and 70 per cent of teachers reported that they made wide use of PER assessment results to analyze teaching methods and school strategies in order to improve quality of education (*Table 2*). Principals had a slightly more positive opinion about the use of results than did the teachers. Evidence suggests that PER had some unexpected effects. For example, PER seemed to encourage most teachers to read the new syllabus approved in 1981 by Government Decree No. 4002 – in the

initial interviews for selecting the objectives of the assessment instrument few teachers had known
about it.

Regional education officials agreed that principals and teachers were using PER results to improve teaching (*Table 3*), though at a lower rate than did principals or teachers.

Table 2. School activities benefiting from PER results reported by principals and teachers, 1982-1984

Activity	Principals	Teachers
	%	%
- Identify good and weak aspects by subject	88.6	79.9
- Annual work plan in each subject	79.4	69.7
- Implement better teaching methods	79.3	66.9
- Evaluate strategies tried out at school	73.2	*
- Plan activities for the whole cycle	77.8	*
- Optimize allocation/use of teaching staff	72.2	*

Note *: Question not included in teachers' survey.

Source: Majluf ; Maltes ; Himmel ; Lopez, 1985.

Indeed, while regional officials believed that 61 per cent of the schools used PER results for analyzing the syllabus and pedagogical practices, they estimated that less than 30 per cent of the schools would introduce specific changes in school activities.

Table 3. Estimated use of PER results in five types of school activities reported by Provincial officials

School activities	Percentage
Area: *Curriculum*	
Analysis of programmes in subjects included in PER	61
Assign priorities to education objectives	17
Increase teaching time for subjects included in PER	11
Programming remedial activities	5
Area: *Teaching methods*	
Hold workshops on alternative methods	22
Revise and modify present methods	17
Design 'learning guides' for relevant learning experiences	6
Apply personalized and co-operative learning	6
Area: *Evaluation*	
Use objective tests (similar to those used in PER)	28
Interest to attend upgrading courses available in region	14
Revise methods used to translate scores into grades	6
Evaluate achievement in terms of objectives	6
Area: *Counselling*	
Increase objectives/attention to affective domain	33
Increase activities in personal dimension of students	22
Analyze programme for social behaviour and attitudes	17
Emphasize teachers' role in education (over instruction)	6
Area: *Management*	
Allocate teachers with specialization in subject matter	22
Assign materials and funds to schools with poor performance	6

Source: Maltes ; Himmel, (1988).

Starting in 1983, regional officials suggested their supervisors visit schools which had poor test results for two consecutive years, to assist those schools to improve their work. Regional officials reported that, in addition to sparking improving supervision, PER results were used to improve teaching methods and as the basis of workshops with supervisors, principals and teachers (*Table 4*).

Table 4. Use of 1984 PER data and 1988 SIMCE data

(a) Use of PER data reported by provincial officials, 1984 (percentage of provinces reporting this type of use)

Identify supervision needs	83
Analysis of data with supervisors and headmasters	75
Workshops on curricula and educational materials	71
Assistance to schools with problems	63
Identify determinants of achievement levels	33
Identify and select strategies for increasing achievement	33
Prepare educational materials	29
Evaluate remedial activities	17
Produce guidance materials	8
Exchange of pedagogical experiences	8

(b) Use of the SIMCE data, 1988 (percentage of supervisors reporting this type of use)

Not used; ignored	11.6
Start using by themselves	14.1
Ask assistance to a supervisor for using the data	39.0
Start improvements by following guidance manuals	11.7
Use data by following manuals and other strategies	16.0
Use SIMCE data as well as other sources/measures	7.6
Total	100.0

Sources: Maltes ; Himmel, 1990.

In summary, the main objectives of PER, to raise the awareness of supervisors, principals and teachers of the main education problems seemed to be reached, at least in the opinion of the main parties concerned.

Use of SIMCE results (collected in a similar survey in 1990) was also positive, but suggests a lower level of use than that reported for PER. Supervisors believed that about 35 per cent of schools used SIMCE results to find better ways to teach students, even though another 39 per cent requested assistance from supervisors to understand the printed results received from SIMCE (*Table 4*).

Supervisors reported that they made as good a use of SIMCE results as their bosses, and much better use than the 60 per cent usage rate reported for the school level (*Table 5*). Supervisors, however, reported that their more distant superiors at the regional secretariat made a very poor use of SIMCE results.

Table 5. Supervisor ratings* of the utility of the 1988 SIMCE data

At the school level:	
Principals	5.64
Head of technical units	6.18
Teachers	5.73
By type of school:	
Municipal	5.37
Private subsidized	5.52
Private (tuition fees)	4.78
Ministry of Education officials:	
Regional level	4.90
Provincial level	7.71
Supervisors (individual)	7.57

* (scale 1 = lowest to 10 = highest).

Source: Toro, CPEIP (1990).

Characterization of learning levels by schools and groups

The three testing programmes generally showed low achievement levels, widely attributed to the context in which schooling occurred. However, results also indicated many schools in which students were able to obtain high scores in spite of an adverse context. The three programmes showed particularly low achievement among students who were at disadvantage in terms of socio-economic status (SES), urbanization levels and type of school. Results of PER and SIMCE, however, had a much wider diffusion on mass media and the message was received by a larger audience. Nonetheless, information presented by the media was misleading because most of it reported results in terms of one variable at a time, rather than the results of a multivariate analysis, in which the effect of intervening variables was controlled (CPEIP, 1983).

The PER assessment showed that 90 per cent of the schools were performing below the level that teachers defined as the minimum level (60 per cent) they expected from students (Himmel, 1986). The national average was below 60 per cent correct, as were results for 'non-tuition schools' serving lower socio-economic groups. Results of the PER and SIMCE tests also showed that only non tuition (subsidized) schools served students from the lower socio-economic groups (*Table 6*).

When inequity is measured as the differences between gross scores, it underestimates the real level of inequity. The average per cent (of items) correct (by school) reported in the mass media were not adjusted for guessing. The correction for guessing tend to be larger for the most deprived groups of students, suggesting even greater disadvantage. Net scores (discounting the effect of chance) are presented in the next section.

The differences reported by type of school have been misleading.

Table 6. Fourth grade students' PER scores by source of funding and SES 1983 - 1985 (reported as per cent of correct answers)

Funding	SES	Number of schools	Spanish			Mathematics		
			1982	1983	1984	1982	1983	1984
Private	A*	110	76.5	71.0	79.7	71.0	71.7	73.5
Subsidized	A	30	72.4	68.0	74.1	67.3	67.3	67.3
Subsidized	B	1 022	61.6	57.3	64.2	56.5	56.7	57.8
Subsidized	C	1 085	54.1	50.2	56.8	49.2	49.1	50.9
Subsidized	D	313	48.7	46.7	52.4	42.9	45.3	47.0
Total country		2 560	58.6	54.7	61.4	53.5	53.9	55.4

* A = highest SES to D = lowest SES

Source : Documentation del PER, Fundacion Andes - Universidad Catolica, 1989

Reports showing that private subsidized schools scored higher than municipal-public schools have been widely distributed,[3] but no information was provided on at least three relevant factors: (i) repeaters are usually expelled from private schools and must be accepted by municipal schools; (ii) parents have received information that private education is better, therefore those most concerned about the education of their children and financially able should have moved their children into private subsidized education; and, (iii) new private subsidized schools are performing at a much lower level than older schools of the same type. Repeaters who have transferred to municipal schools tend to reduce average scores of municipal schools. Parents more interested in education are associated with higher achieving students (even if their decision is made with limited or misleading information).

New private schools tend to be created for profit, while older private subsidized schools were mainly operated for religious or civic goals. The two different incentives may lead to quite different results. Scores of traditional and new schools are quite different (*Table 7*).

Moreover, the differences in scores between new private subsidized and municipal schools are minimal, even though the transfer of repeaters and the interest of parents are not controlled. But this information has not been disseminated and is not widely known or understood.

Although the analysis by items suggest that at least half of the grade 4 students are not able to understand what they read, this message did not reach the mass media. Only in 50 per cent of the items, students from higher socio-economic background (in private or municipal schools) were able to correctly recall ideas, characters or activities from short paragraphs. The results of the writing test were not commented by the media.

Interesting data on the limited abilities of teachers' were collected by the team of the Universidad Catolica, but had a restricted circulation. In 1985 the team organized a two-day workshop for 170 fourth grade teachers. Among other activities the teachers responded to the grade 8 questionnaire administered at the end of 1984. Average scores of the grade 4 teachers were lower than the scores of the grade 8 students.

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[3] "Some findings are clear: private education has better performance and municipal education the opposite" reported one of the national newspapers (La Epoca, Segundo Cuerpo, Sunday, 8 September 1991, pp. 6 and 7). Similar statements were reported in all mass media.

Table 7. Per cent of correct answers by type of school and SIMCE, 1990

County and socio-economic level	Mathematics			Spanish		
		Private/Subsidized			Private/Subsidized	
	Municipal	New	Old	Municipal	New	Old
Santiago Oriente (336 schools)						
High (A)	-	-	73.0	-	-	75.5
Mid-High (B)	67.1	66.9	65.8	68.7	68.9	67.4
Mid-Low (C)	55.5	58.7	58.2	56.4	59.7	59.2
Santiago Poniente (212 schools)						
Mid-High (B)	62.2	61.7	65.8	62.7	64.6	66.9
Mid-Low (C)	54.1	55.2	60.6	55.2	57.0	61.5

Source : J. Morales with data from SIMCE - LOGRO, CPEIP, 1991 (T. 17)

Note : Private subsidized schools are split into NEW (less than 10 years old) and OLD (schools with 10 or more years in operation)

Table 8. Fourth graders achievement scores in Spanish, 1982-1988

Socio economic level	Size of city	Spanish in 1982				Spanish in 1988			
			Scores				Scores		
		Sample	Gross	Net	%	Sample	Gross	Net	%
Paid/Private									
High	Metro	4 822	81.3	72.0	100	6 928	79.5	69.3	100
	Large	1 961	80.7	71.1	99	3 613	80.1	70.2	101
Mid	Metro	2 445	77.0	65.5	91	1 929	75.2	62.8	91
	Large	3 693	75.2	62.8	87	2 448	73.7	60.6	87
Subsidized/Private									
High	Metro	1 172	69.2	53.8	75	800	70.5	55.7	80
	Large	1 304	74.7	62.1	86	1 802	76.3	64.5	93
Mid	Metro	15 361	62.0	43.0	60	15 162	63.6	45.4	66
	Large	10 569	64.4	46.6	65	14 002	66.7	50.0	72
Low	Metro	6 555	56.6	34.9	49	24 900	55.5	33.3	48
	Large	2 081	54.0	31.0	43	12 114	54.1	31.1	45
	Rural	4 673	51.5	27.3	38	4 894	50.5	25.8	37
Cat D	Metro	0	0.0	0.0	0	472	45.7	18.6	27
	Large	0	0.0	0.0	0	865	45.1	17.7	26
	Rural	0	0.0	0.0	0	1 542	37.6	6.4	9

Municipal											
High	Metro	605	72.7	59.1	82	0	0.0	0.0	0
	Large	1 382	67.6	51.4	71	0	0.0	0.0	0
	Rural	507	65.7	48.6	67	0	0.0	0.0	0
Mid	Metro	19 749	58.5	37.8	52	5 053	60.8	41.2	60
	Large	14 481	61.8	42.7	59	13 752	63.2	44.9	65
	Rural	40 340	58.2	37.3	52	1 640	58.1	37.2	54
Low	Metro	25 049	54.0	31.0	43	32 072	50.8	26.2	38
	Large	14 071	56.2	34.3	48	56 395	51.7	27.5	40
	Rural	33 042	51.1	26.7	37	33 690	46.1	19.1	28
Cat D	Metro	0	0.0	0.0	0	196	49.2	23.9	34
	Large	0	0.0	0.0	0	3 429	44.2	16.2	23
	Rural	0	0.0	0.0	0	9 071	42.6	13.8	20
	Total	203 862	58.6	37.9	53	246 769	55.0	32.5	47

Source : CPEIP, Serie Estudios No 81, 1983 and SIMCE data 1988.

Notes : Each item has three alternatives and good distractors. Large cities have 20,000 people or more, but exclude the capital city. In 1988 near 73 per cent of all students (and near 60 per cent of the students in private subsidized schools) had Spanish scores below half the score of *students from the high socio-economic level attending private schools in the capital city* .

All this information collected by PER and SIMCE amounted to a total cost of over US$.8 million, and the question that really matters is whether the benefits generated by this information were consistent with the cost. In the next section a comparison of scores over time is reported, which provides a partial response to this question.

The impact of the assessment on the quality of basic education

From 1982 to 1988, students' scores in Spanish remained essentially constant across similar groups of schools (*Table 8*). If anything, average scores tend to be slightly reduced in that period. The same pattern occurred for mathematics, as expected, given the high correlation between the Spanish and mathematics tests (discussed earlier).

This pattern, seen as stagnating, will be analyzed in the next section in order to check whether the expectations on PER and SIMCE were too high to identify possible changes in the Chilean assessment programme.

Comparison between 1982 and 1988 scores is relevant because:

(i) Items were validated (and the average expected score calibrated) with the same type of sample;
(ii) control variables were defined in the same way; and,
(iii) there were no changes in the social composition of students since 100 per cent of school-aged children enrol in school (and have since the late 1960s).

However, the comparability is not totally valid since the SIMCE included an additional socio-economic group and an additional geographic category.

Net scores of students from low socio-economic groups ranged between 30 and 40 per cent of the net scores of students from high socio-economic groups in the 1982-1988 period.

Constant differences in the scores of homogeneous groups over time suggest that inequity was not reduced in the period under study. However, these data should be reanalyzed to include a correction for guessing, since students answered practically all questions. For example, grade 4 students had three options in each answer, hence, the average raw score of someone answering by chance (guessing) would be 33 per cent, while the net score (corrected for guessing) should be zero.

On the other hand, a student with 100 per cent gross correct answers, would also have the maximum net score.[4]

Comparison with the 1990 results is more difficult because: (i) the so-called homogeneous groups have a larger variance than groups defined by the three variables used in the past and (ii) the sample for calibrating the PER was bipolar in the capital city[5], while the sample for SIMCE was proportional to socio-economic groups in the capital and a small city. While the average SES background of children in the capital city tends to be slightly above the national average, the average SES background in the rest of the country tends to be lower than the national average. Therefore, use of the proportional sample in constructing the SIMCE may have resulted in an easier test than did use of the bipolar sample used in the PER. This resulted in about a five per cent increase in 1990 gross scores (SIMCE) compared to the 1988 gross scores (PER).

The differences in the samples used for calibrating the tests can be eliminated by expressing the scores of both years in terms of standardized scores (with mean 50 and standard deviation 10). Comparisons of standardized scores for homogeneous structures do not show substantial changes in the 1988-1990 period.

In summary, the dissemination of school level achievement data back to the schools, intended to spark competition among schools and greater attention of teachers to their pedagogical practices, has not resulted in measurable increases in average school achievement scores during the 1982-1988 period.

Neither has it reduced the disparities in achievement across different socio-economic groups over time. The same conclusions are reached when figures for 1983 and 1984 are compared with the 1988 scores.

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[4] The formula that assigns proportional net scores for cases between both extreme cases is: Net score = Gross score - 0.5 (100 - gross score). This formula can be applied when: (i) the percentage of non answers is very small (near 1 per cent in this case); and (ii) those 'answers that are correct only by chance' are proportional to the number of errors, and it can be assumed that fourth grade students were not using special strategies to increase the probability of success (discarding less probable answers). For the sake of simplicity the net scores are expressed in percent of the net score of the "students in (non subsidized) private schools catering for high socio-economic groups in the capital city" (this group represents the 100 per cent score).

[5] Half of the students were in private schools catering for socio-economic group A and the other half in public schools catering for socioeconomic groups C and D.

Discussion of results

At least two tentative explanations can be suggested for the constant levels of achievement observed in the period under study. One is related to management problems, the other to teaching traditions. These tentative explanations eventually could be tested when other countries carry out similar assessment programmes.

The first tentative explanation deals with the lack of use of assessment results by senior management within the Ministry of Education. Three factors contributed to this lack of use: (i) high turnover of ministers (five between 1981 and 1984); (ii) lack of senior officials able to see the potential uses of the assessment data in decision making or able to ask for specific types of relevant information; and (iii) lack of computer processing capacity for using the tapes at the locations where the SIMCE information was recorded. For example, the CPEIP officials suggested alternative ways for using the information and had the technical capacity, but did not have access to computer facilities for processing the tapes (CPEIP, 1983; Schiefelbein ; Ortiz, 1982; Guida, 1984). PER results did help improve school supervision. Supervisors started using PER results to target more attention to low achieving schools in 1984 and continue using those results even when no assessments were carried out in the ensuing years.

The second tentative explanation deals with teaching traditions. Teachers tend to use as their criteria that students should learn at least 50-60 per cent of the curriculum objectives (Himmel, 1986). Teachers, therefore, may have been satisfied if the assessment report showed that students reached that level. If the report showed achievement levels lower than 60 per cent, teachers may have felt that such poor results are caused by exogenous factors beyond their control (Himmel, et al., 1984). If the report showed achievement levels much higher than 60 per cent, it was unlikely that teachers would change their methods. In summary, there were probably few ways in which teachers would be willing to change their instructional methods, except for marginal aspects. If this is true, the initial assumption that the teacher would be the driving force for change (when the information about poor achievement levels were released) was not a realistic assumption, and the expected effects of the assessment programme were too optimistic.

The overall low achievement levels suggest that there may be additional causes, probably linked in a complex web (Schiefelbein, 1991).

Additional ways for using information

The impact of the Chilean assessment programme may increase if the data are used more systematically for improving the quality of education delivered. Four additional ways for using information to improve instructional practices are: (i) to analyze item response data to provide specific guidance information to teachers; (ii) to analyze school performance to identify efficient schools that can be visited by headmasters or teachers willing to replicate some of their methods; (iii) to identify particularly weak schools to be given greater attention to by supervisors; (iv) to analyze background information in relationship to student achievement in order to identify effects of educational inputs or processes. In addition, further thought should be given to the distribution of assessment results. Public comparison of performance can trigger a debate as to causes of poor performance.

The analysis of item response data is the main source of specific guidance for teachers. Properly interpreted, the full response profile (showing the proportion of students choosing each of the alternative answers) can provide teachers and supervisors with a great deal of information as to why performance in certain topics is weak. However, teachers need help to understand item-response profiles. The booklets prepared for PER and SIMCE are a positive step to help teachers, but need to be more specific, analyze examples in detail and provide clear guidance for classroom work as it was done in Kenya (Somerset, 1982). It is not enough to suggest the need for active involvement of the student, but to give examples of how this can be accomplished. These insights should also be incorporated into in-service and pre-service teacher training programmes.

The analysis of school performance is the main way of identifying efficient schools — schools that are performing at high levels in spite of working with deprived students — which then can be visited by headmasters or teachers willing to replicate some of their methods. In 1990 about 4 per cent of the schools serving for the lower-middle socio-economic group averaged more than 70 per cent answers correct (112 schools in a total of 2852) while 3 per cent of the schools serving the lower socio-economic group averaged more than 70 per cent (30 schools in a total of 1114). These average scores are higher than the average of all schools combined, with the exception of the private schools serving the upper socio-economic levels.

Efficient schools are operating in all regions, thus it is easy and inexpensive to organize brief visits (one to three days) for other headmasters and teachers working in the same region. Data from the 1988 SIMCE were, for the first time, used to identify efficient schools. The information was distributed to supervisors, but it is not known whether visits from other educators occurred.

There is a smaller number of schools that had high scores during two or more consecutive years. These schools can be used as models for good schools that want to continue raising their performance levels. Of the schools serving the lowest socio-economic group, most are rural and operate multi-grade classrooms. Seven of these had particularly high levels of student achievement in the 1988 and 1990 assessments. These seven schools are distributed across five regions of the country.

The analysis of school performance also provides one way to identify aspects of teachers' instructional practices needing more attention from supervisors. There appears to be groups of schools in given geographical areas that have high average scores, perhaps related to the quality of supervision. Case studies of these areas could be used as the basis for training other supervisors. About ten areas strategically distributed in the country would be enough to provide one week of upgrading per year (in small groups) for all the 748 supervisors now working in the country.

SIMCE data about the worst performing schools have been used to select the schools for participation in the 'programme of the 900 schools' (Ministerio de Educacion, Chile, 1990). In addition to present remedial actions, it would be useful to collect information on the main problems observed in these 'worst' schools. Such information could be used to develop a framework for correcting future educational problems. Further, the systematic analysis of supervisors could help identify key variables constraining higher levels of achievement.

The analysis of the relationships between background information and assessment results should help identify the effects of educational inputs on students' achievement. For example, the analysis of school achievement showed that new private subsidized schools (opened after 1981) are no better than municipal schools. Future provision of new types of textbooks, computers, new types of teacher upgrading, and other changes in inputs could be evaluated, in part, in terms of their impact on student achievement in each of the years following their introduction. By including a number of finely tuned indicators, educators can better tell if particular practices, teaching training approaches, or curricular materials are effective. Adequate funding and professional linkages should be built into the system to ensure that relevant research is carried out using the assessment results. Data should be easily accessible by university researchers interested in further analysis of this type of data.

These four examples of new uses of the assessment data — *specific guidance to teachers, selection of demonstration schools, assistance to supervisors*, and *evaluation of the impact of educational strategies* — may illustrate the potential for further change.

Conclusions and recommendations

The main conclusions deal with: (i) the excellent technical quality of the instrumentation and the processing and distribution of information to parties concerned; (ii) the risks of losing qualified technicians and adding cumbersome bureaucracy due to the transfer of the assessment programme to the Ministry of Education; and (iii) the history of poor data utilization.

Analysis of assessment results, surveys, reports, visits to schools and discussions with the Ministry of Education officials suggest that SIMCE is efficiently assessing students' academic achievement and that other dimensions of achievement can be eventually included. It has been ranked as the most successful experience in the Latin American region (Horn ; Wolff ; Velez, 1991). The specific aim of the Chile programme was to use the assessment results to effect educational policy and to strengthen teaching practice. However, the impact to date seems to be minimal. Nonetheless, further efforts to use information (as suggested below) may eventually generate the expected impact on students' learning levels.

The transition from the present operation, which is university-contracted, to a new government agency may hinder the ability to deliver a high quality assessment on a tight schedule. The transition is triggering a lot of questions about how SIMCE should be organized, who should be in charge, where it should be located, and what aspects should still be contracted. The programme has strong support from the MOE, as well as from practitioners and there is agreement that the technical capacity of SIMCE should be maintained at a high quality level even if assessment responsibility is transferred to the Ministry of Education. However, high quality of assessment can only be guaranteed if highly qualified consultants (technicians) keep working with SIMCE.

The SIMCE operation makes sense if high MOE officials are interested in assessment information. This is the *main finding* from the *three assessment programmes* operated in Chile over the last 25 years. If the MOE is not interested in using SIMCE results, then the assessment would make sense only if senior researchers can make use of the data in order to identify problems and suggest the most efficient teaching methods. This is one of the reasons for the following recommendations for ways to improve research based on the assessment data. Three recommendations are proposed below, each intended to contribute to increasing the quality of education:

(i) improve the guidance information available to teachers to help them improve their teaching skills;

(ii) increase the amount of relevant research on the determinants of academic achievement; and,
(iii) find ways to engage academic institutions in the design, testing and analysis of the assessment, including the possibility of them using the data to make relevant comparisons over time.

Careful analysis of item response data should be used to improve the guidance information for teachers to upgrade their teaching skills and for headmasters to improve their management skills. The analysis should be carried out for the country as a whole, by gender, by region and province, by rural-urban breakdowns, by type of school (private, subsidized, municipal), and by socio-economic level. Analysis should seek not only to identify problems, but to identify the sources of those problems. Therefore, analysis may include suggestions for revisions in textbooks or instructions for supervisors. Special instruments to feed back guidance information to the schools should be designed (size, edition and format should be attractive enough for teachers to read the material). These instruments (or communication channels) must be focused on key problems, because the implications for classroom work must be illustrated with concrete examples. Reports should be limited to 30 or 40 pages at most, given teachers' reading speed (often lower than 200 words per minute) and lack of time for (or tradition of) professional reading.

There is a need to increase the amount of research on the determinants of academic achievement both to service the needs of the MOE and to provide additional insights on educational problems. To better examine the determinants of educational achievement, certain basic data may be needed, for example, the real length of the school year, average number of days attended, hours per week the school is open, annual number of pages of free-writing, type of textbook (self-formative, traditional, non available), teacher training, teacher turnover, and amount and type of homework. The insights of supervisors about causes of poor performance of schools selected for detailed analysis may also be researched in a systematic way. In summary, research must be built into the assessment system and the background information questionnaire can be gradually broadened to become more useful (and cost-effective) for research relevant for decision making.

Operational mechanisms must be designed to engage academic institutions in further research and in improving the quality of the assessment itself. Easy access to assessment data is an effective way to interest senior researchers (psychometricians, econometricians, educational analysts) at universities and academic centres. They can complement available information with data on variables that can be obtained through field work (use of class-room time, teachin methods, access to radio or TV, and nutrition or hunger), in order to find cost-effective ways of increasing student learning. Senior researchers can also become interested in the *design, testing* and *analysis of assessment tools*, particularly if they allow comparisons over time. A joint Ministry of Education and non-profitmaking research institution will help to ensure that technical expertise is available for a continuous improvement of the assessment programme.

Finally, SIMCE staff must keep in mind that comparisons over time are important for understanding achievement processes. Therefore, from the outset testing instruments must allow comparisons over time in spite of all changes introduced in those instruments. Adding a longitudinal component to the assessment process will permit a much richer analysis of the relationships between the students' educational histories and the outputs and outcomes of the educational process (Schiefelbein ; Farrell, 1982).

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Chapter 7

Toward a better understanding of the functioning of school systems for better decision-making: the case of primary schools in Togo[1]

Ayélé Kudjoh
Ministry of Education, Togo

Alain Mingat
University of Dijon, France

Introduction

Many African countries have experienced considerable expansion of their school systems since the sixties. Public resources for the education sector generally have increased at a faster rate than the country's national economic wealth, under the combined influence of an increase in the state budget's share of Gross National Product (GNP) and an increase in education's share of the national budget. Over the last ten years, the financial resources of the general budget and of the education sector have been subjected to evident constraints. Enrolment rates in a number of African countries are still low, notably at the primary level, and universal basic education remains a distant objective in an environment characterized by rapid population growth. Moreover, considerable criticism has been directed at the low quality of education offered in many countries.

The major challenges facing a majority of African countries include the need for macro-economic adjustment, the need to increase enrolment rates (even at a time of rapid population growth), and criticism of both the quality and relevance of education. Most people realize that it is not possible to overcome the present difficulties of education with traditional recipes; following new paths is in some sense unavoidable. However, these new paths are not clearly laid out. Those responsible for the education sector are often poorly placed to respond to proposed budget reductions mandated by higher levels of government or from international financial institutions. One path to explore consists of substantially improving our knowledge and understanding of how schools function as a basis for identifying interventions to improve the quality and efficiency of education. Countries differ in the way they organize and finance their schools. Those countries also differ in the outcomes of schooling. The examination of macro-level data provides a means of identifying the contribution of different patterns of inputs to educational outcomes.

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[1] The work described in this report received financial support from both the Ministry of Co-operation and Development, France, and the Research Department of the World Bank.

Across Africa, there are considerable differences in the percentage of national budget allocated to education (from 1.5 per cent to 9 per cent of GNP) and wide differences in the manner in which the education systems of the different countries operate. One might imagine that these two statistics are strongly correlated – that countries spending more also have a more developed system. This is not necessarily what one observes. The correlation between these two indicators is positive but weak ($r<.15$).[2] This indicates that some countries have achieved relatively high levels of educational development without investing a lot of public money while others have achieved only modest educational development despite the investment of rather substantial resources.

This suggests that alternative ways of organizing and financing schools may yield quite different outcomes. For example, across countries, pupil-teacher ratios vary from 20 to 70, average teacher salaries vary from 2 to 13 times the country's per capita GNP, and primary school repetition rates are varying from 1 to 36 per cent of grade enrolment. Planning is not a matter of organization and technical co-ordination of actions decided by others but rather a question of justifying the most basic choices of educational policy. Yet, in few (if any) countries do educational planners have a clear idea about what organizational and policy choices will lead to the educational outcomes they seek. The types of educational data typically collected to assist educational planners have often been found to be of little relevance or use. In efforts to improve data use, one might envisage the collection of different types of data and analyses. To do that requires a consideration of analytic and methodological issues that have been encountered, issues that are examined in the next section.

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[2] See, for example, Mingat, A. (1991). "To what extent is budgetary constraint a limitation for quality enhancement and extension of coverage? A case of sub-optimality of public education in Africa"; delivered to the colloquium *Strategies and Modalities for Educational Financing in Africa*; UNESCO; Port Louis.

Analytic and methodological issues

Education is very much a field of opinions and words. The common practice on the part of both national governments and international agencies is to base actions on the opinions of officials or experts who, in turn, tend to adopt a normative approach as to what should be done based on their own field observations and experience. This approach is not recommended for two reasons:

First, social phenomena in general, and educational phenomena in particular, are not immediately transparent. Educational processes involve numerous variables both internal (e.g., class size, teachers' level of education, instructional materials, teaching methods) and external (e.g., pupil characteristics, social and environmental factors) to the school. Moreover, processes occurring at school are time dependent. For example, pupil achievements and inequalities accumulate throughout schooling. It is difficult to identify the specific factors that determine desired outcomes of schooling (such as student achievement) in the course of a given school year. *Second*, educators hold divergent opinions as to factors that influence pupil learning. For instance, some teachers insist that pupils learn little in classes of a 100 or more, while others argue that it is possible, with appropriate pedagogical strategies, to make classes with large enrolments function quite reasonably. Similarly, some educators hold that teaching is sufficiently difficult that one should avoid the additional complications posed by multi-grade classes, while others suggest that multi-level class settings can be taught effectively using differentiated pedagogical methods that can actually enhance student learning.

Given the complexity of teaching and the variety of beliefs about what teaching strategies are most effective, it is necessary to have recourse to direct factual justification that goes beyond personal subjectivity. In education there are no control mechanisms comparable to the market mechanism of the competitive economic sectors that provide feedback on what actions are effective. All the more reason why it is essential to employ rigorous analysis of evidence in any debate on schooling. In this respect, three important dimensions should be considered:

(i) In the analysis of schooling, more stress is put on input characteristics than on the products of schooling (e.g., pupil performance, school careers, inequalities, etc.). The imbalance in attention to inputs is partly that these items are more directly under the control of educational planners and managers and partly because inputs tend to be more directly visible than the products of schooling. When talking about a good school, it is common practice to stress teacher qualifications, class size, or the availability of educational materials than pupil performance or equity of educational access.

(ii) Shifting to an emphasis on outcomes is not easy because data on what pupils learn often are not collected. Such data collection is cumbersome and is often based on sample surveys rather than complete school population statistics. A second difficulty is encountered in relating pupil performance to explanatory variables. The multitude of possible explanatory variables (e.g., characteristics of the pupil, family environment, teacher, class, school) requires multivariate analyses be used to identify which factors are related to what pupils learn and their relative importance. The model of factors related to pupil learning has a temporal dimension. Education is a process of transformation from what children know at the beginning of a year or a cycle to what they know at the end of that time. Hence, it would be incorrect to attribute performance levels at the end of a school year to the teaching conditions encountered just in the course of that year. Performance in a given year reflects the foundation built throughout the child's school experience. Factors likely to explain individual performances also have a temporal dimension that must be considered. The characteristics of the child's and the family exert a permanent influence on pupil performance, whereas the influence of a particular teacher's characteristics is generally limited to a single school year.

(iii) The influence of any particular factor on student learning may depend on the intensity at which that factor is present. To define an education policy means first to determine the changes to be made with respect to an initial reference situation. There is little point in trying to assess whether teacher qualifications have an impact on pupil performances, the question is too general. Rather, the question is better posed in marginal terms: what is the impact on pupil performances of a qualitative improvement in the teacher qualifications. It is probable that the empirical answer to this question will be different, according to whether teachers are recruited at the end of their primary or at the end of their secondary education. The educational impact of teacher training has to be qualified by knowledge of the initial conditions.

The collection and analysis of data must be organized in a way that overcomes these difficulties, which is now possible given the availability of advanced statistical procedures and electronic data processing. The implementation of these techniques requires special expertise, a necessity if one wants to base policies on the empirical analysis of data rather than more intuitive bases.

This being said, the determination of the relationship between the way schools are organized and pupil performance must be viewed as only a first stage in the process of justifying educational policy decisions. In addition to identifying the relative impact of different factors, it is important to define priorities, since the resources available in a given country generally do not make it possible to undertake all the actions that may be considered desirable. The factors submitted to analysis may all contribute to raising pupil achievement and may all serve to mobilize financial resources. Under these circumstances, what is important is the marginal impact of each school factor (on pupil performance) relative to its cost. In this way, it can be determined how best to organize schools to maximize pupil learning while minimizing unit cost.

This type of analysis provides a basis for examining the more general trade-offs between quantity and quality. Policies aimed at enroling the maximum number of pupils and those aimed at maximizing student performance are generally incompatible, regardless of the resources available. What is required is finding an appropriate balance.

In the remainder of this chapter, we report the results of a research study conducted in the primary education system of Togo. The following sections describe the education system, the research study, and selected results.[3]

Characteristics of the survey carried out in Togo

A strategy for better understanding the educational process involves both the examination of consistent relationships among variables and the examination of why those relationships vary across school contexts that are themselves different. In Togo, as in most African countries, there is substantial variation in teaching conditions across geographical zones, and even more, among schools in the same zone and between classes in the same schools. Class size, which averages 54 pupils, varies from 10 to more than 150 pupils. Teachers' prior preparation ranges from having only a Certificate of Primary Studies (CEPE) to having a post- Baccalaureat degree. Only about 20 per cent of primary teachers have received training at Teacher's College. Teaching generally takes place in classrooms made of hard construction materials, but about 25 per cent are made of clay (banco) or plant materials.

This variety of educational environments makes Togo an interesting context for the study of the impact of different factors on pupil performances. The sample for this study was constructed to reflect this variation. The unit of observation was the pupil, since student performance is the reference for judging quality of education. Secondly, the modes of school organization were the independent variables of interest, since these are the modifiable factors and the levers of education policy. Moreover, it is these modes that determine costs. The unit of analysis was the class, since it is at this level that education policy is realized, in the sense of determining a school environment common to a group of pupils.

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[3] The data and analyses presented in the text are extracted from J.P. Jarousse ; A. Mingat, *L'école primaire en Afrique, fonctionnement, qualité, produits : le cas du Togo*. (The primary school in Africa, functioning, quality, products: the case of Togo), 1991.

In the present study, the sample was established by taking the class as the starting point, and then considering all the pupils in each of the selected classes. The strategy was employed not to produce a sample representative of Togo's schools but, rather, one that would reflect the variety of these schools. The goal was not to represent the current system, but to learn from the prevailing variety in order to change it. All the problems connected with sample size naturally cropped up. In order to capture the variety of educational conditions, it was desirable to consider a relatively large number of classes. At the same time, it was necessary to keep the sample size manageable, especially since classes average more than 50 pupils in classes at the primary school level. Finally, it seemed possible that the influence of teaching conditions would differ as a function of grade level and pupil age. For example, one might expect that class size would have a more negative impact on learning for younger children than among those further along in their school career, as older children are perhaps more capable of working independently.

For practical reasons, it did not seem possible to include all six years of primary school in the survey, therefore just two grades were chosen. It did not seem appropriate to include pupils in grade 1 (CP1), given the practical difficulty testing young children who were new to schooling and had not been exposed to written tests. Hence we opted for pupils in grade 2 (CP2). For the end of primary school, we selected the second-to-last year (CM1) in order to avoid the special pressures that characterize the last year of primary, when transition into secondary is the main objective.

The trade-off between the desirable (a sample consisting of many classes) and the possible (ability to manage a survey of this type in the African context) ultimately resulted in a sample of 128 classes from 64 schools (one from CP2 and CM1 levels in each school). Classes were selected to represent the widest possible variety of actual teaching conditions, though it was not possible to incorporate too great a number of criteria in a sample of this size. Sample selection proceeded as follows:

To capture geographical variation, etc., which itself partially reflects other types of associated varieties, eight primary level inspectorates were chosen in eight districts located in different regions of the country. This selection was determined in a way that concentrated the survey areas in order (i) to maximize homogeneity of data collection conditions and to minimize training of data collectors and (ii) to ensure good supervision of data collection by local staff. Within geographical areas, sampling procedures incorporated information on class size, type of course (single or double year), and teachers' amount of pre-service training.

Two questionnaires were designed and distributed in the course of the school year, one collected data about each pupil, the other collected data about each classroom teacher. The latter collected data on the number of teachers in the school, number of pupils (including repeaters) at each level, the school's geographical situation (rural dispersed, rural concentrated, urban, suburban), type and number of rooms, and school facilities (water, electricity, toilets, school cafeteria, etc.). Regarding the class more specifically, the questionnaire collected information on classroom organization, class enrolments by level, type of construction and dimensions of the classroom, furnishings (number of tables with attached benches, table and chair for the teacher, number of cupboards and blackboards, chalk supply, etc.), number of books available for lending to pupils, and number of books owned by pupils. The questionnaires also collected information on teachers' age, sex, initial level of education, initial and continuous professional training, professional experience, mother tongue, and language spoken (in relation to the mother tongue of the pupils), extra-scholastic activities, pedagogical style, number of days absent during the school year, and monthly salary.

The pupil questionnaire collected information on pupils' age, sex, previous schooling (number of years in pre-school and at each primary school grade), health, attendance, distance between family home and school, education and occupation of parents, languages spoken, language written and/or read by parents, extent of participation by pupil in family activities, pupil's equipment (uniform, satchel, notebooks, writing slate, reading book, arithmetic book), and number of brothers and sisters at school.

Pupils also completed a performance test administered at the beginning and again at the end of the school year. The test was based on the content of the curriculum, and was developed with the assistance of the team of eight Togolese Inspectors and national pedagogical officers from the Ministry. The tests were distributed by pedagogical counsellors from the school districts involved, on the basis of standardized instructions.

Table 1 below reports the distribution of selected characteristics of the schools, classes, teachers and pupils for the sample as a whole and separately for four geographical zones.

Table 1. Selected characteristics of the schools, classes and teachers

	Urban	Suburban	Rural Concentred	Rural Dispersed	Total
Schools (CP2/CM1)	22	8	23	11	64
CP2 pupils	1 428	508	1 059	350	3 345
CM1 pupils	802	353	685	213	2 053
Schools with water (%)	48.7	64.4	23.0	32.6	41.2
Schools with electricity	27.7	37.0	0	0	17.4
Schools with toilets	40.8	39.0	18.5	26.6	32.0
Pupils/class in CP2	76.5	92.3	68.0	59.9	74.5
% combined classes - CP2	0	8.5	23.8	36.0	12.6
Pupils/class in CM1	53.3	61.0	49.9	33.0	51.4
% combined classes - CM1	12.7	11.9	48.9	45.0	28.0
% 'solid' classrooms in CP2	68.3	64.4	80.7	61.4	70.9
No. of pupils per m² CP2	1.5	2.1	1.2	1.3	1.5
% 'solid' classrooms in CM1	84.7	74.2	92.7	59.1	82.9
No. of pupils per m² CM1	1.1	1.3	.9	.8	1.0
CP2 Teachers' educ. level					
Primary (CEPE)	10.9	0	34.4	22.3	17.8
Lower secondary	55.3	61.4	16.1	17.1	39.9
Lower secondary graduates	18.8	0	14.9	27.7	15.6
Upper secondary	3.9	0	19.8	28.0	10.9
Baccalaureat or higher	11.1	38.6	14.7	4.8	15.8
CM1 Teachers' educ. level					
Primary (CEPE)	0	0	0	0	0
Lower secondary	0	4.8	15.7	13.1	7.5
Lower secondary graduates	19.8	12.5	23.2	40.8	21.8
Upper secondary	68.8	30.9	32.9	46.0	47.9
Baccalaureat or higher	11.3	51.8	28.2	0	22.7
% Teacher's college in CP2	8.7	25.6	17.0	0	13.0
% Teacher's college in CM1	21.1	60.6	18.8	8.0	25.8
% Male teachers in CP2	41.7	19.7	79.2	84.6	54.7
% Male teachers in CM1	77.3	87.5	100.0	86.9	87.6
% Boys in CP2	55.3	57.1	62.5	64.0	58.8
% Boys in CM1	57.9	62.1	75.2	69.5	65.6
% Children of cadres in CP2	12.2	6.3	6.2	3.7	8.5
% Children of cadres in CM1	14.4	8.8	10.2	4.7	11.0
% Children of parents with no French in CP2	45.1	39.6	73.8	75.0	56.5
% Children of parents with no French in CM1	31.0	29.5	67.6	75.1	47.5
% Repeaters in CP2	39.9	40.1	32.4	34.4	37.0
% Repeaters in CM1	30.4	24.6	29.1	31.4	29.0

The purpose of this chapter is not to examine to what extent and in what respect schooling conditions differ from one place of instruction to another within Togo's education system, nor to carry out a comparative analysis of education in Togo with respect to what prevails in other countries. Rather, our purpose is to identify which factors seem to make a difference in pupil achievement, as a basis for informing education policy choices. However, prior to reporting the correlational analyses, it is useful to provide some descriptive background on education in Togo as a basis for interpreting some of the later results.

Classes at the CP2 level averaged 68 pupils per class (74.5 if one includes the CP1 Enrolment taught jointly in combined classes). However, actual enrolments varied widely, ranging from 18 to 130. This variation was a function of geographical zone, ranging from 85 in the sub-urban environment to 43 in the dispersed rural environment. It must be noted, however, that there is still a large intra-zone variation, with classes ranging from 33 to 114 in the sub-urban environment, and from 18 to 95 in the concentrated rural environment. Combined classes are found in both urban and sub-urban environments, but more frequently in rural than in urban areas, especially at the CM1 level. This pattern holds true in the type of classroom construction materials, with a greater proportion of traditional built classrooms in the dispersed rural zone, but with construction of this type present in all the different geographical zones.

The density of pupils in the classroom (the ratio of pupils to classroom surface area reported in square meters) averaged 1.5 in CP2, 1.0 in CM1. Classroom density is subject to substantial variation, partially a function of the geographical zone in which the school is located. For instance, at the CP2 level, the minimum density is 0.49 (approximately 2 square meters per pupil), while the maximum is 2.9, a teaching situation with a very high physical concentration of pupils.

The ratio of reading books per pupil is .36 at the CP2 level, and .316 at the CM1 level. For arithmetic books the corresponding figures are only .059 in CP2 and .113 in CM1.

This ratio of books per pupil is slightly higher in urban than in rural areas, but varies greatly within zones when the statistics are compared at the class level. Over all classes, the ratio varies from as little as .05 to as much as .95.

The above descriptive information illustrates the variety prevailing within the sample, as well as the approach adopted of not just considering 'typical' situations (large urban classes, built of solid materials, with books and with only one level per class, as against small rural classes, built of traditional materials, with few books and functioning as combined classes). The goal was to employ a diversified sample as a basis for statistically separating the influence of different school organization factors on pupil performances.

To the extent that deliberate choices were made as to the inclusion of schools, the structures of the sample (such as teacher qualifications or class size) is not necessarily representative. As mentioned earlier, the sample was not intended to be representative of the situation in Togo but, rather, to capture existing variety among school conditions. Nonetheless, when the data are statistically adjusted to a representative structure, relatively small overall differences are observed over the original data. For example, the overall score on the test taken at the end of the year was standardized so as to yield a sample mean of 100 and a standard deviation of 15; the adjusted estimation was 101.4, indicating that very little adjustment was required.

In comparing CP2 and CM1 classes, female teachers were more frequently assigned to the CP2 than CM1 levels and were found at a higher rate in urban than in rural areas. On average, teachers assigned to CM1 had better academic qualifications. Most teachers at the CM1 level had at least completed upper secondary school, whereas only a quarter of CP2 teachers are educated to this level. Similarly, 25 per cent of CM1 teachers had received teacher training while only 13 per cent of CP2 teachers had this level of preparation.

Comparisons of pupils across grade levels indicated that the number of pupils in CM1 is substantially smaller than in CP2, a reflection of the high drop-out rate in the Togolese system. The drop-out rate was lower among boys than girls and among children of professionals than of non-professionals. Children whose parents did not read, write or speak French were also more likely to leave school.

The purpose of providing the preceding information was to present the educational context of Togo as a backdrop for interpreting the relationship between modes of school organization and pupil performance.

The relationship between school organization modes and pupil performance

However important the differences in pupil characteristics and teaching conditions may be, they must in fact be combined with differences in the initial performance level of these same pupils (which depend on the school and extra-curricular experiences of the children from birth, and also on specific personal characteristics, such as individual aptitudes and personality traits),[4] when it comes to explaining pupil performances at the end of the school year.

The analytic strategy employed in this study consisted of adjusting student end-of-year performance scores for differences in initial performance to yield a change score. This change score is understood as a measure of student achievement during the year under study. This is sometimes referred to as a *value added model*. The issue of interest is the extent to which specific teaching conditions or practices contribute to this change. It should be noted that this term 'change' is to some extent inappropriate, because one is not really measuring pupil progress on an absolute cumulative scale. The two scales (initial and final performance) are not directly commensurable; they are standardized independently, with the same mean of 100 and standard deviation of 15. Thus each scale corresponds to a ranking of the pupils. What is really being investigated is the extent to which individual variables or teaching conditions are able to modify the initial pupil ranking. The question under investigation is whether pupil performance improves or deteriorates as a function of the characteristics of his education context during the school year.

Before presenting the empirical results, it should be stressed that it is not sufficient to consider pre-test performance, pupils' socio demographic characteristics, and characteristics of the teaching environment if one hopes to explain all the variability in pupil performances during the course of a school year. Two other methodological points need to be considered: the first concerns measurement errors, the second regards variables omitted from the data collection and analysis.

Measurement errors: Measurement error, inherent in any empirical study, includes two types of problems. The first has to do with errors of recording or interpretation. For example, a male pupil may have been recorded as a girl. The second type of measurement error concerns the reliability and validity of the test itself. For example, a test necessarily assesses pupil performance on only part of the curriculum. Individual scores are inevitably distorted by the external conditions of testing and weaknesses in item construction. Hopefully, these errors are random in nature[5] and pose a minimal threat to the validity of the study findings.

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[4] These personal variables (which are not observable to a large extent) are not measured directly in this survey. However, this shortcoming is not an essential one, since they are present in an empirical way in the initial pupil performance levels, which are in fact measured.

[5] It is not specifically girls rather than boys, or pupils enrolled in a large class rather than those in a small class, who are favoured or disfavoured in a systematic manner.

Variables omitted from the analysis: However many precautions are taken, there is always the risk that relevant variables have been omitted which, if they had been included would have resulted in a different explanation of the influences on pupil performance. Omitting relevant variables can have two consequences. First, it can lead to a partial explanation of the impacts on student learning. Second, it can result in incorrect estimates of the impact of variables included in the analysis, particularly if they are significantly related to the absent variables. Of particular concern is the omission of pupil and teacher characteristics which, if included, would have significantly predicted performance.

For example, direct measures of pupil aptitude and personality were absent, though indirect evidence of aptitude was available in the initial score of pupils at the beginning of the school year. These initial scores, however, combine aptitude with the quality of education received in previous years. Teacher effectiveness, while certainly a function of teachers' academic and pedagogical training, professional experience, and the material conditions prevailing in their classrooms, also depends, to a large degree, on factors specific to each teacher, on the instructional methods they employ, and the relationships they establish with their pupils. To a great extent, these factors are not under the direct control of planners or policy-makers.[6] The relations between teacher and pupil generally have two dimensions – an individual dimension and a collective dimension. The latter encompasses those characteristics of teachers' activities that have consequences for the general quality of their teaching and, therefore, applies to all pupils in the class.

The absence of measurement of the individual dimensions of the quality of teacher-pupil relationship has limited impact on the explanatory power of the analysis since those differences are randomly distributed. The collective dimension of teacher effectiveness probably depends on a set of parameters that were absent in the Togolese data set.[7] It is possible through the use of categorical coding of teachers to examine differences in teachers' pedagogical effectiveness across classrooms.[8] In so doing, one evaluates mean performance variations among classes after statistically controlling for initial pupil ability and other pupil characteristics.

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[6] Even though education policy should in fact deal with teacher supervision, through both inspection activities and the management of schools.

[7] This is also true of the very great majority of studies carried out in developed countries.

This procedure makes it possible to assess the magnitude of performance differences among classes but not the reasons for those differences (e.g., pedagogical methods, teacher-student relationship, teacher's charisma).

Let us now examine the empirical results obtained from the Togolese data.

Results: predictors of pupil performance[9]

Table 2 reports the proportion of variance on the end-of-year test scores that is explained by the main predictor variables. Overall, they account for 41.9 per cent (CP2) and 48.9 per cent (CM1) of the variance in end-of-year pupil performance. The explained variance increases to 48.9 per cent and 54.5 per cent, when differences in personal pedagogical effectiveness of teachers is taken into account. These results compare favourably with those obtained in comparable studies in both developing and industrialized countries. The variance explained by the different variables sets is not additive (*Table 2*). *Diagram 1, see Appendix A, page 173*, reports the intercorrelations among these variable sets in the analysis of CP2 data.

At this level of analysis, there are two findings worth highlighting. First, school organization variables do not explain much of the variability in student performance (at CP2, $R^2=.057$, at CM1, $R^2=.042$). Second, pedagogical effectiveness of teachers explains more variance in student achievement ($R^2=.07$ at CP2) than do school organizational variables. Factors under the control of educational planners (e.g., teaching conditions) have less of an impact on pupil performances than those factors under the control of the teachers themselves (e.g., the quality of their relations with pupils, their individual charisma, the motivation and energy they bring to bear in the exercise of their profession). This finding naturally raises questions about the relative importance that should be attributed to activities of a logistics nature

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8. "If the teacher explains things well, all the pupils benefit". It may be the case, of course, that certain pupils (the weakest, or possibly the best) benefit more than others; however, one can think in terms of the mean effectiveness for the pupils as a whole.

9. The results considered at this point apply to the average performance in French and mathematics, given that we are interested in the overall functioning of the school. Results making a distinction between these two subjects will be given later.

versus those of a pedagogical nature (e.g., teacher support, incentives, supervision) in the planning and management of education.

We can now examine, in a more detailed fashion, which factors account for variation in student achievement. Results for CP2 and CM1 are presented together to allow for an examination of the similarities in findings across the two analyses.

Table 2. Variance in end-of-year performance explained by selected groups of variables

Variables or — groups of variables	Per cent of variance final score explained	
	CP2	CM1
	%	%
Main effects		
IND (individual variables)	12.9	7.1
COS (school organization characteristics)	15.4	14.5
SCO (initial score)	28.2	40.3
CLA (classes — silent variables)	22.3	24.9
Interactions		
IND × COS	22.7	16.2
IND × SCO	36.2	43.1
COS × SCO	37.9	45.9
IND × COS × SCO	41.9	48.9
IND × COS × CLA	48.9	54.5

Emphasis in the interpretation is on the school organization variables (rather than the individual factors), since they are of greater relevance to educational planners.

The impact of the different variables is evaluated in terms of pupil performance, which is measured on a standardized scale with mean 100 and standard deviation 15.

Variables related to pupil performance

Personal characteristics

At both of the two educational levels under study, girls tend to make approximately 1.5 points (or 0.1 standard deviations) less progress than boys. The difference is statistically significant but too small to be of practical importance. To get a sense of the role of the child's family environment, one can consider the combined influences of the parents' knowledge of French, their profession, and the geographic locations of the family and school. Other things being equal, children from different geographical zones differed in the amount they learned during the school year. There is no overall distinction between urban and rural, but there was a significant difference between the performance of pupils in the dispersed rural zone as opposed to the performance of students in the concentrated rural, urban and suburban zones. This pattern of difference is more pronounced at the CM1 level (4.5 points) than at the CP2 level (2.6 points).

Parental occupation was related to modest differences in pupil performance, but in an unexpected way: After statistically controlling for other factors in the analysis farmers' children had progressed most. Children of professional ('cadres') parents made slightly better progress at school than children of labourers or salaried employees. In CP2, the advantage of farmers' children was 1.5 points over cadre children and 2 points over children of labourers and salaried employees. At CM1, the advantage of farmers' children was 1.0 over the children of professionals and 1.7 points over children of labourers and salaried employees.

Since the language of education is French, it was expected that parents' ability to read and write in French would make a difference in children's achievement. Three cases were considered: when neither of the two parents knew French, when just one of the two parents (in most cases the father) was able to read and write in French, and when both parents were fluent in French. At CP2, no difference in pupil performance was observed among these three groups. At CM1, children with neither parent knowing French had a small handicap (1.5 points), a difference that was not statistically significant.

The lack of significant differences are due in part to the high intercorrelations of these variables.[10]

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[10] They are not completely independent, since farmers rarely live in town, and generally do not know French; on the other hand, there are numerous farmers in concentrated rural zones, and many fathers classified as labourers do not know how to read and write the French language.

The school network in Togo is relatively dense, with local schools situated relatively close to inhabitants in the majority of cases. In almost 85 per cent of cases, children needed to travel less than one kilometer to a primary school. In the rural environment, the distance was somewhat greater. In the dispersed rural zone, for instance, more than 30 per cent of pupils had to travel more than 1 km (but almost always less than 3 km). One might expect that a greater distance from school would be associated with a higher frequency of late arrivals; however, this was not the case. There was not a significant relationship between distance to school and student achievement. On the other hand, pupils who frequently arrived late did most poorer performances, especially in CP2 (-1.5 points). This may be due to spending less time at school, but it is probable that frequency of late arrival at school also reflects less motivation on the part of the child or less supervision by the parents.

Another issue pertains to the amount of work children do at within their family environment. Amount of time children spend working at home did not have a negative influence on their performance in CP2, and only a small but negative impact in CM1. No doubt the average intensity of what is required of CP2 children is limited, whereas by the time pupils reach the CM1 age, family responsibilities are considerably more demanding.

Variables related to school organization

One can distinguish among several groups of variables: those pertaining to pupils, those pertaining to the 'logistics' of the class, and those pertaining to the teacher in charge of the class. Let us examine these different points in succession.

School characteristics pertaining to the pupil

The impact of prior schooling (particularly pre-school attendance), was examined for pupils at the CP2 level. Kindergarten attendance is relatively rare in Togo, only about 9 per cent of the sample attended kindergarten. Moreover, kindergarten attendance is essentially an urban phenomenon. At present in Togo, approximately 15 per cent of pupils in urban zones, 9 per cent in suburban zones, 3 per cent in concentrated rural zones, and 0 per cent in dispersed rural zones attend kindergarten. Kindergarten attendance can be justified in terms of both day-care benefits to the parents and socialization benefits for the child, to the extent that pre-elementary education provides a preparation for primary school. In this study, only the socialization component could be evaluated.

Kindergarten attendance was found to have a significant negative correlation with pupil achievement. Not only did pupils who attended pre-school have lower performance levels at the beginning of CP2 (-2.6 points), but they also made less progress during the CP2 year, compared to children having the same sociological characteristics and the same level of initial performances (-1.7 points). Thus it appears that pre-school, as it is presently organized in Togo, does not have a beneficial effect on preparing children for primary school.[11] Primary teachers in Togo report that children in pre-school learn mainly to develop their social skills and to play. The children tend to view school as a playground, which may undercut attentiveness in class.

The data also provide a basis for examining student grade repetition. The data indicated that, at the beginning of the year, students who were repeating the grade at the CP2 and CM1 levels had a higher average performance level than non-repeaters (+4.7 points at the CP2 level) and that, taking this initial advantage into consideration, repeaters progressed just as well during the year as their non-repeating counterparts at both the CP2 and CM1 levels.[12] Those repeating a year benefit from having already been exposed to the curriculum in question.

Findings indicated that students at each of the grade levels who had repeated an earlier grade found it more difficult than students who had progressed normally. This pattern is probably due to repeaters having a lower average level of ability (despite the overall inefficiency of the repetition decision process).

Findings indicated that the school equipment possessed by the pupil (satchel, notebooks, pencils, uniform, etc.) was not related to pupil performance. Pupils in Togo generally were well equipped with school supplies, even in rural areas. The same cannot be said about school textbooks, however. Only about 30 per cent of pupils have access to their own reading book, which appeared to have a particularly strong impact on pupil performance. The impact of textbooks on performance was examined in two ways: the first approach related the proportion of reading books in the class to aggregate class performance, the second was conducted with the individual pupil as the unit of analysis to determine the relationship of book possession and pupil achievement.

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[11] This does not put into question the possible validity of the pre-school education concept, for it is conceivable (naturally, this deserves an empirical demonstration) that such education, if organised differently, could produce more satisfactory results.

[12] Analyses carried out in other contexts show that decisions to impose repetition in Togo (this result may turn out to be valid in other Francophone countries) raise two problems: on the one hand, there is a high degree of individual inconsistency in these decisions, in the sense that there are numerous repeating pupils with an actual performance level higher than that of pupils promoted to the next class; on the other hand, numerous repeaters have an absolute performance level that is relatively high. These analyses show (i) that decisions to impose repetition could be managed more effectively, and (ii) that the proportion of repeaters could certainly be cut in half with no pedagogical damage to the system, but with obvious overall advantages.

The relationship between textbook availability and pupil performance may not be linear. Recent evidence from the Philippines found that the impact of textbooks on achievement fell off after the point at which there was one textbook for every two pupils. Prompted by this earlier finding, an analysis was conducted with the present data to examine the possibility of a decreasing marginal effect, or a saturation effect, of textbook availability on pupil performance.

Results of this analysis indicated that (a) both measures of textbook availability (individual and collective) were related significantly to pupil performances, (ii) that the impact of overall textbook availability at the classroom level was greater than the impact associated with private possession of the book, and (iii) that there was no decreasing effect in the relationship of textbook availability on performance. More books led to higher achievement.[13] Moreover, the results at the CP2 and CM1 levels were similar. The findings indicated that, if 100 per cent of pupils were supplied with reading books, there would be an increase in the average performance level of 10.5 points in CP2, and of 8.1 points at the CM1 level.

These results highlight the importance of the reading book for primary school performance. However, one should not infer that all school textbooks necessarily have the same importance. The survey also provided information about the availability of arithmetic books. Availability of arithmetic books was not significantly related to student performance in arithmetic at either the CP2 or CM1 levels.[14]

Classroom logistics

The study also examined the relationship between the material characteristics of the school and pupil performance, in particular the type and dimensions of classroom construction and amount of equipment and furnishings (cupboards, tables with benches, blackboards and chalk, etc.). These two characteristics were not significantly related to student achievement. In particular, there was no significant relationship between the type of materials used in school construction and the amount students learned. While there was considerable variation in the density of pupils in the classroom, density did not have detectable relationship to performance. Similarly, the proportion of children seated in normal conditions (two children per table-bench with two seats) within a classroom was not related significantly to pupil achievement.

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[13] One reason for the continuing positive impact of the proportion of reading books in the class is, according to Togolese educators, that when there are few books, the teacher mainly uses the blackboard; on the other hand, when the proportion of books increases, the collective blackboard-based teaching is partially replaced by book-based teaching, which is more individual and apparently more effective. The fact that the impact of the book continues up to one book per pupil obviously has considerable education policy importance.

[14] We shall see later that the breakdown of performance by discipline (French and mathematics) makes it possible to complement and partially to correct the conclusions valid for overall performance.

The lack of relationship between characteristics of the classroom construction and furnishing and pupil performances in Togo should not be taken as a reason for offering children more rustic material conditions. Student comfort must be taken into consideration. It is also possible that the material quality of the school is related to demand for education and the pride a community takes in its schools. Nonetheless, these findings may have implications for educational policy, particularly as they may provide a basis for rethinking investments in school construction as a means of raising student performance.

Another characteristic of the classroom context concerns the number of pupils taught within one classroom. This variable is important because it is widely believed to have pedagogical consequences and because class size is one of the key components of the per-pupil cost of education. It is widely assumed that pupil performance will be negatively affected by the number of pupils in the class and, as a corollary, that the negative effect of a large class size will be greater among younger children, who are more dependent on the teacher's constant support (CP2), than among children more advanced in the school programme, and with a greater capacity for working independently (CM1).

Results of this study are only partially in line with these expectations. While there was a negative relationship between class size and achievement, the relationship was the same at both the CP2 and CM1 levels. The point to be stressed, however, is the relatively low magnitude of the correlation. Pupils do appear to learn less in large classes, but not much less. The marginal impact of class size on achievement tended to be less pronounced in larger class sizes (beyond 55 pupils). *Table 3* shows the downward pressure on pupil performance of increasing class size, after statistically controlling for the impact of other factors.

Between a class of 30 pupils, which would seem to many educators to be an appropriate (or even ideal) size, and a class of 100 pupils, the difference in pupil performance was only 6.2 points (.41 of a standard deviation). On the other hand, the per-pupil cost of a class of 30 is 3.3 times higher than that of a class of 100.

Table 3. Declining average pupil performance as a function of the number of pupils in the class (CP2 - CM1)

Class enrolment	Average performance %
30	100.0
40	98.8
50	97.6
60	96.6
70	95.9
80	95.2
90	94.5
100	93.8
130	91.7

The study also examined student achievement in single-grade versus multi-grade classrooms. As indicated earlier, educators hold divergent opinions as to the appropriateness of teaching in multi-grade classrooms. In Togo, multi-grade classrooms are the combination of two levels. At the CP2 level, the merger involved pupils from one level down (CP1); at the CM1 level, the merger was with pupils from one level up (CM2). The analysis indicated that better academic progress was made by pupils in combined classes than by pupils enrolled in single grade classes. The difference in performance amounted to 7.2 points in CP2 and 4.8 points in CM1. Therefore, it would seem that the organization of multi-level classes have their own pedagogical advantages, perhaps due to the greater role given to personal work by pupils and the exposure to curricula and materials from two adjacent levels.

The examination of factors such as classroom organization requires that the influence of other factors, such as class size, be statistically controlled, a procedure employed in the present study. However, it should be noted that multi-grade classes in Togo normally have an enrolment double that of single-grade classes, a reality that needs to be considered in formulating educational policy from the present results. The negative impact of larger class sizes, then, needs to be considered as an off-setting factor in evaluating the positive impact of multi-grade classes. For example, if a single-grade class with 30 pupils served as the reference group and scored 100 points on the achievement test, a multi-grade class with 30 pupils would have an average score of 107.2 at the CP2 level and 104.8 at the CM1 level. If, on the other hand, there were 30 pupils in each of the two levels taught separately, the performance of CP2 pupils would have been 103.8, that of CM1 students 101.4. Students in the multi-level classroom had a higher average achievement than students in the single-level classes. The positive gain in achievement outweighs the negative impact of the larger class size. However, these results also have to be evaluated in terms of the cost savings of the multi-grade class. Multi-grade classes offer obvious economic advantage, particularly in rural areas characterized by otherwise low student teacher enrolments. Based on these findings, it appears that the combined class organization should be recommended in Togo.

Teacher characteristics

Differences in the student performance can be examined in relation to teachers' characteristics (e.g., training, sex, experience) and their professional performance.

Teacher gender: Analysis of the Togo data suggests that, after statistically controlling for other factors,[15] CP2 pupils taught by female teachers performed better than students taught by male teachers, (having a female teacher contributed to a 3.0 point advantage). The opposite was true for the CM1 level for having a male teacher (a 2.5 point advantage). This difference in the effectiveness of male and female teachers is probably a function of the children's age, a point that will be discussed later.

Teacher training: Amount of teacher training is of particular interest, because it is widely believed to impact educational quality. Moreover, it has dramatic cost implications, as teachers with more training receive higher salaries. The training of teachers has two components, general and professional, and the latter component has two dimensions, initial and in-service. Each of these aspects was examined in the Togolese data.

Results indicated that the relationship between the duration of their studies and the subsequent performance of their students was small. The educational level of the teacher did not make much difference in how much pupils learned. *Diagram 2 (see Appendix A, page 174)* illustrates the differences in achievement among students having teachers with different levels of education. Similar results were observed at both the CP2 and CM1 grade levels. In both cases, the differences in achievement were less than 5 points. This finding does not support the policy followed in Togo of appointing teachers with more training to the higher grade levels (here CM1) in primary education.

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[15] In particular, it is not appropriate to take into consideration the gross differences between the sexes, given that women teach more frequently in urban zones, with pupil populations that are different from the average population, but especially in classes with higher than average enrolments.

The second observation was that the relationship between teacher level of education and pupil performance is not linear. Overall, teachers with more training tended to teach better, but there was a saturation effect. Teachers with a Baccalaureat were less effective, on average, than teachers with only an upper secondary level education. This suggests that there is little point in teachers studying beyond the latter level, given the nature of the tasks they are expected to perform as a *primary* school teacher.[16] Further, teachers having a Baccalaureat or more are often in a situation of personal failure, for they consider teaching at the primary level as more of a demotion than a promotion.[17]

Caution is needed in interpreting the policy implications of these results. One policy consideration is to find an appropriate balance between the benefits and the costs of additional training. Salary in Togo, as in most countries, is tied to level of education. Yet present results suggest teachers' level of education is not strongly linked to student performance. It may be appropriate to disconnect salary from educational level in recruitment of primary school teachers. This could be done by establishing the minimum acceptable education level to be a primary school teacher and then recruiting individuals fulfilling that minimum. This approach replaces payment for degrees with payment for service.

The relationship of *teacher training* to student achievement differs between CP2 and CM1. In CP2, there was no significant relationship of either pre-service or in-service training and pupil learning. At CM1, both these types of training had a modest, though significant, positive relationship to pupil performance (2.5 points for each of the two types of training).

The findings concerning teacher sex and amount of training can be interpreted together. Younger children did better when taught by female teachers, though amount of teachers' training was not related to pupils' performance. Older children did better when taught by male teachers, though amount of teacher training also appeared to impact on achievement. One possibility for this pattern is that the pedagogical practices most effective for teaching young children are poorly developed and while the training if better suited to the teaching of children further along in their schooling. Perhaps the pedagogical methods taught in teacher training are not terribly useful in the early grades, leaving teacher to rely on their personal abilities. The generally greater experience of women in working with small children, then, may explain why women appear to be more effective in working with young children.

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[16] The tasks are to help young children to learn to read, write, count, reason, memorise simple facts, etc., and not to carry out complex operations requiring knowledge at a high level. With respect to children in primary, the 'competence' dimension of the teacher is no doubt more important than the 'knowledge' dimension.

[17] It is especially because they have not succeeded in completing post-secondary studies (all Baccalaureat holders in Togo attempt to do so) that these individuals agree to become teachers, for lack of anything better; this does not predispose them to focus all their energy on the exercise of their profession.

Amount of teaching experience: Results indicate that teacher effectiveness increased with the number of years on the job at the CP2, where it appeared that teachers had more need to rely on their own insight and experience in teaching young children. The main difference appeared to be between teachers with less and those with more than five years of experience. Students taught by teachers with more than five years experience averaged of 2.7 points more in achievement gain during the year. At the CM1 level, teacher effectiveness did not increase with seniority.

Language of instruction: A final teacher variable examined was whether teachers belonged to the same linguistic group as the children they taught. Problems in teacher-student communication can seriously impede student learning if pupils are unable to understand teachers. Such language problems can also complicate teacher assignment systems, making it harder to provide qualified personnel where needed. Three types of classrooms were considered: those in which (a) pupils and teachers belonged to the same linguistic group, (b) pupils and teachers did not belong to the same linguistic group but the teacher was able to communicate in the language of the pupils, and (c) pupils spoke a language that was incomprehensible to the teacher. In the Togo data, the first category includes about 60 per cent of the pupils, the second about 15 per cent, and the third 25 per cent.

Findings in the Togo study were more positive than expected. At the CP2 level, there was no significant difference in pupil performance across the three types of classrooms. At the CM1 level, pupil achievement was significantly higher in classrooms in which teachers did not know the language of the pupils; students in these classes scored about 1.8 points higher than students in the other two types. One possible reason for this finding is that when pupils and teachers do not share a common local language, they use French, the official language of instruction, even for informal communication. This extra practice in French may help students in their formal studies.

Student performance in French and mathematics[18]

At CM1, boys scored higher than girls in mathematics, but there was no difference in French; at CP2, boys outscored girls in both subjects, particularly in mathematics. Socio-economic background accounted for little variance in pupil achievement is the two subject areas. On the other hand, the availability of textbooks in mathematics was not significantly related to mathematics achievement at either CP2 or CM1. However, the availability of reading books in French explained a substantial amount of variation in students' French performance in mathematics in CP2. This may reflect the general importance of being able to read French as a prerequisite to being able to understand the instructions in any of the pupils' other textbooks.

Class size had virtually the same, though limited, effect on pupil performance in both subject areas. Similarly, the positive effects of multi-grade classes were observed in both French and mathematics, though a slightly greater positive effect was observed in French. Pupils in multi-grade classrooms at both CP2 and CM1 scored 8 points higher in French. In mathematics, students in multi-grade classes scored 6.5 points higher at CP2 and 3 points higher in CM1 than students in single-grade classes.

While this study examined factors related to pupil performance in Togo's primary schools, the larger purpose of this chapter was to suggest how such studies can contribute to improving the quality and functioning of educational systems in developing countries.

Conclusion

The Togo experience supports *three observations*. *First*, it illustrates that this type of study can be carried out in a low-income country, though it should be added that the Togolese education system seems to be relatively well organized. *Second*, it shows that this type of study can yield findings about the structure and operation of the country's education system which, though important for education policy-making, do not emerge from the routine collection of statistics typically undertaken by ministries of education. Indeed, the type of analysis reported above usually cannot be conducted with the data countries typically collect because pupil performance is generally not included in their data collection. These types of analysis require that pupil performance and school organization data are collected and maintained in ways that would allow a merger of the data sets at the individual student and the classroom levels of aggregation since it is the analysis of the relationship between school organization and pupil performance that matters most.

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[18] These are the two basic subjects, and data on performances in other disciplines were not collected; the global analysis is easy to justify with reference to the general modes of primary school organisation, which do not provide for specific conditions for individual disciplines.

A *third* observation is that, while results of this kind of analysis can be useful in informing educational policy, they are not, by themselves, a sufficient basis for policy formulation. Responsible education policy must also consider costs, and the trade-offs posed by limited resources between actions that would improve quality and those that would expand access. Information about the relationship between teaching conditions and pupil performance must be supplemented with data on the relationship between teaching conditions and per-pupil cost. On the basis of these two sets of relationships, one can associate both an average level of pupil performance and a per-pupil cost with each of the potential possibilities for organizing education. One can then describe these possibilities in a performance-cost space, and determine an efficient combination of factors – those resulting in a maximum level of pupil performance for each level of per pupil cost, or the combination that best achieves the minimum per-pupil cost for a fixed performance level. Under these conditions, the results of the analysis allow for an even more lucid justification of policy decisions, by offering the decision-maker a range of options within the subset of possibilities that are efficient in both pedagogical and economic terms.

An important question remains: To what extent can one export the findings from Togo to other countries, especially those in the same region? Caution is necessary. Some relationships are probably more generalizable than others. For example, the relationship of pupil performance to class size may not be as sensitive to differences across countries as, perhaps, the relationship between pupil performance and teacher training or pupil performance and pre-school education. On these points it should not be assumed that the Togolese results are generalizable.[19]

Finally, a last observation is that estimates of the relationships between teaching conditions and pupil performances may lead to new questions and new ideas among educators and officials responsible for organizing a country's education system. In this regard, it is the specific points that generate the most interest. Thus, once these relationships have been identified, one is inspired to look for the underlying reasons that may be explain them. For example, what is it in the present organization of pre-school education that is inadequate?

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[19] This does mean that it is of no interest for other countries to know that pre-school education or teacher's college training (for young children) are not necessarily efficient in pedagogical and economic terms; similarly, it is of interest for all countries of the region to know that education in combined classes (even if it is especially well organised in Togo) may turn out to be an advantageous formula.

And, how can one modify pre-school functioning so as to improve its effectiveness?[20] It is understood that one then has to verify whether the changes made in pre-school organization are really leading to the expected impact on pupil performance.

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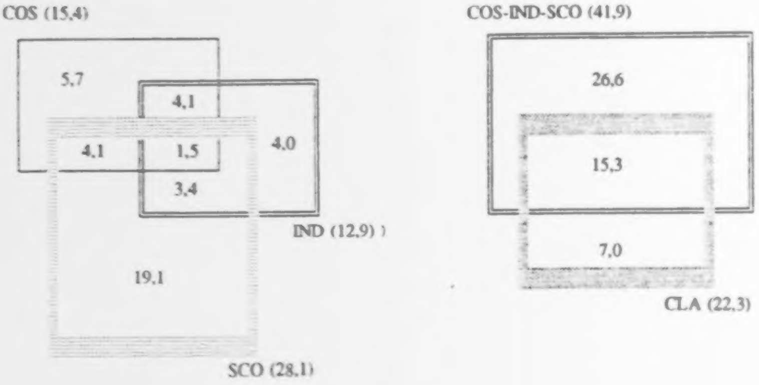
[20] This could well be a starting point for specific targeted studies, with the possible application of different methodologies especially of qualitative ones.

Appendix A

The figures presented in *Table 2, page 160,* indicate that the contributions of the different groups of variables are not additive. *Diagram 1* below shows how the effects of these groups of variables are related to one another, on the example of the CP2 classes. The left part of the diagram shows the statistical inter-dependencies among the three groups of explanatory variables taken into consideration. One sees the irreplaceable role of the initial score (SCO), whose simple contribution is 28.1 per cent, but whose unitary contribution in the global model amounts to 19.1 per cent.

Diagram 1. The contribution of the different groups of variables to the explanation of variance in performance at the end of CP2.



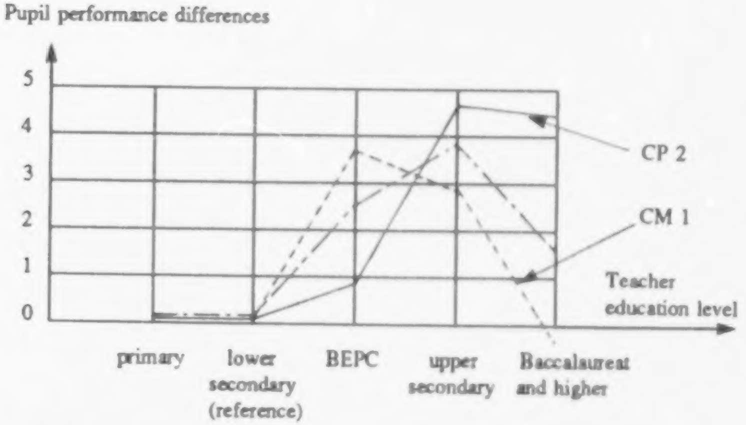
Overall explanation due to COS × IND × SCO = 41.9 %

Overall explanation due to COS-IND-SCO × CLA = 48.9%

The unitary shares of the COS and IND sets of variables are considerably smaller (respectively 5.7 per cent and 4.0 per cent); however, at this stage of the analysis, one does not know how to break down the (partial and common) intersections of the three groups of variables (they are fairly significant, representing 13.1 per cent of the variance in the end of year score).

The right part shows that belonging to a class is associated with a gross figure of 22.3 per cent, which is almost as much as the simple statistical impact of the initial score (28.1 per cent). This being said, part of these gross inter-class differences are due to differences in the characteristics of the class populations, and in the teaching conditions prevailing in the classes; nevertheless, there remains a non-negligible unitary component (7.0 per cent) that very clearly points to the existence of differences in the personal pedagogical effectiveness of teachers.

Diagram 2. Difference in pupil performance (CP2 and CM1) due to differences in the teachers' initial studies (the lower secondary level serves as the reference)



Average differences

0 0 + 2,4 + 3,8 + 1,7

Chapter 8

Reform of basic education in Mauritius: the process of information gathering, consultation and decision-making

Rajayswar Bhowon
Ministry of Education and Science, Mauritius

Vinayagum Chinapah
Institute of International Education,
Stockholm University, Sweden

Introduction

The Government's decision to reform basic education in Mauritius at the beginning of the 1990s was a necessity, both for individual children and for the nation as a whole. Over the years, evidence from a series of government-appointed commissions of inquiry, numerous educational surveys and a large number of position papers from education-related groups suggested the need for a reform of basic education in Mauritius. In spite of the fact that the country was already successful in the early 1970s in implementing a six year universal, free primary education with automatic promotion, about 25 per cent of all children still failed (after two attempts) the Certificate of Primary Education (CPE) administered at the end of Standard VI (the last grade of primary education) and dropped out of the system at the age of 12 or 13. The gap between the best and the worst schools at both the primary and secondary levels had continued to widen. The practice of private tuition had increased tremendously, further undercutting teachers' commitment to public schooling. It was not acceptable to the Government to have such a wastage and discrimination in the country's education system.

This paper focuses on the reform process of basic education in Mauritius which ultimately resulted in the *Mauritius Master Plan for the year 2000*. More specifically, it examines the complexity of policyformulation and decision-making processes that (i) used various ad hoc information collections to supplement regularly collected data, (ii) had recourse to a series of consultations with representatives of the Mauritius society at large, and (iii) experienced an intensive participation of mass media. To better understand the context in which the reform process took place, this chapter first provides a brief overview of the education system in Mauritius, its administrative structure and data collection practices.

Education, management and data collections

Mauritius, an island in the Indian Ocean, is a densely populated country with 1,047,000 inhabitants (1991) living on 1,864 square kilometres. It is a multicultural and multilingual society with a rapidly growing economy — with international standards, it is considered a middle-income country. Education has always occupied a prominent place in the development of Mauritius.

Educational structure and management

At present, about 80 per cent of 3 to 5 year old children attend pre-primary school, most of which are private but benefit from some government assistance. There is universal provision of primary education for six years (Standard I-VI) and the participation rate is nearly 100 per cent in the lower grades. Promotion is automatic, though Standard VI may be repeated. The Standard VI examination (Certificate of Primary Education) selects those students who will proceed to secondary school. For some of those who fail the Certificate of Primary Education, the Industrial and Vocational Training Board offers three year courses, including both basic education in literacy and numeracy and some technical training, leading to a Certificate of Proficiency. There are five years of secondary schooling leading to the School Certificate, and a further two years leading to the Higher School Certificate.

Far more Mauritians pursue tertiary level courses abroad than in Mauritius. There are three local institutions for tertiary education: the University of Mauritius, which offers undergraduate and graduate courses, as well as a variety of sub-degree courses; the Mauritius Institute of Education, which is principally concerned with teacher training, educational studies and curriculum development; and the Mahatma Gandhi Institution, whose emphasis is mainly on Asian culture and the humanities.

Some 81 per cent of *primary* schools are government schools, 17 per cent are Confessional schools aided by Government, and the remaining 2 per cent are non-governmental primary schools which receive no public aid. Most secondary schools are non-governmental. Less than 20 per cent of secondary schools are State schools; a further 10 per cent are confessional schools; and the remaining 70 per cent are other private schools. About 80 per cent of secondary schools pupils attend private schools. Education at nearly all schools and at the University is free.

The Ministry of Education and Science determines the policy for the different levels of education and is responsible and accountable for the running of the educational system. The system is managed under the overall administrative responsibility of the Permanent Secretary. The Ministry of Education and Science is composed of six technical divisions:

(i) Education support services.
(ii) Building and development.
(iii) Planning, monitoring and evaluation;
(iv) Inspectorate;
(v) Curriculum management-secondary; and
(vi) Curriculum: primary.

There are also four divisions dealing with administration, finance, arts and culture and other related matters. In addition to the Ministry, several other bodies and institutions are involved in the development and management of the educational system, i.e. the Tertiary Education Commission, the University of Mauritius, the Mauritius Institute of Education, the Private Secondary Schools Authority, the Mauritius Examinations Syndicate, the Mahatma Gandhi Institute, and, of course, the schools themselves. The present functional and administrative responsibilities are organized as a vertical system of management. As will be shown later, this is not conducive to an integrated and effective delivery of education and a decentralized system of decision-making and management are proposed in the Master Plan.

The current system of data collection

Regular systematic data collections

The primary responsibility for collection and analysis of data in the education sector rests with the statistics section which is attached to the planning, research and monitoring division in the Ministry of Education and Science. The statistics section collects data annually through questionnaires filled in by the schools and also receives consolidated data gathered by other Ministry divisions and parastatal bodies such as the Mauritius Examinations Syndicate, the Private Secondary Schools Authority and the University of Mauritius. The channelling of information from the schools to the statistics section of the Ministry is a comparatively rapid and smooth process by virtue of the country's small size. Before data from primary and secondary schools reach the statistics section, they are scrutinized and validated by the Inspectorate.

As in many countries, data collection by the statistical section focuses upon the most measurable or most easily quantified educational aspects, such as the provision of human and material resources, student enrolment, and student grade progression. However, the coverage and quality of available data place the country's data collection efforts among the best in Africa. The annual school questionnaires collect fairly detailed information on the stock of buildings, facilities, equipment and furniture, changes occurred during the year and new requirements. It also collects data on teacher personal characteristics, professional training, experience, and subject specialization.

More specific information on the current situation of each teacher (e.g., family status, current responsibility, previous posting, salary scale, in-service training attended) is gathered and up-dated regularly by the Inspectorate. The indicators most widely reported by the Statistics Section are the number and per cent of qualified teachers and the student-teacher ratio.

The data collected about students includes enrolment, promotion, repetition and drop-out by grade, sex and age which are used to calculate some of the basic indicators (e.g., admission and enrolment ratios, class-size) and to analyze the internal efficiency of the system. The Mauritius Examinations Syndicate collects student achievement data from the Certificate of Primary Education (CPE), the Cambridge School Certificate and Higher School Certificate examinations. The MES reports results in the form of pass rates by subject, gender, and school. Results are sent regularly to the Statistics Section, the Inspectorate, and the schools. The MES maintains a rather detailed information base.

Like in most countries, data on the teaching-learning process are not collected in a regular and systematic way in Mauritius. 'Teachers' workload' is one of the rare items collected through Ministry questionnaires. Inspectors do assess teacher performance, give advice to individual teachers and organize pedagogical orientation and training activities to groups of teachers. But regular visits tend to be more frequent to schools or classes with problems. Furthermore, inspection reports are rarely used at the national level for evaluating the functioning of the educational system.

Other data collections

There are few examples of periodic data collections (such as surveys) on specific aspects of the educational system which have been undertaken by the Ministry divisions or parastatal bodies. A rather recent one is the study on private costs of education carried out by the University of Mauritius (1988). Several ad-hoc studies have been undertaken, for example, those examining the external efficiency of secondary and higher education. Some studies have been undertaken as part of the preparation of a major educational reform. An example is the survey on science and technical education launched by the working group of the Master Plan for the Basic Education reform in 1990.

The Master Plan: background and aims

Long before the World Conference on 'Education for All', held at Jomtien in March 1990, the Minister of Education went to the Cabinet seeking approval to set up a high-level committee to examine the totality of the Mauritian educational system and to look into the possibilities of a Nine-Year Basic Education for All. This committee came up with the document entitled: *Proposal for structural reform* (May 1990). This document is referred to as the Ramdoyal Report and bears the name of the chairman of the committee, Professor Ramesh Ramdoyal, Director of the Mauritius Institute of Education (MIE). The Ramdoyal Report recommended a seven-year primary cycle, a four-year secondary cycle, and discarded outright the idea of a Nine-Year Basic Education for All. As a follow-up to the World Conference on Education for All the Minister announced the formulation of a Master Plan for Education in Mauritius for the Year 2000. In June 1990, when the new structure to formulate the Master Plan was set up, it seemed as if the 'Nine-Year' basic reform was not feasible. The Master Plan Working Group proposed that the six-year system be maintained but also that the system should be subjected to radical changes, specifically in pedagogy, curriculum, examinations and assessment procedures, school reorganization and staff development.

In the light of the Minister's insistence that the reform of basic education was a top priority, the Working Group again reconsidered different possibilities. It proposed three alternatives: (i) to maintain the present structure but institute qualitative reforms; (ii) to implement the recommendations of the Ramdoyal Report which proposed a seven-year primary and a four-year secondary cycle; and, (iii) to introduce universal basic education for children up to 15 years of age, e.g., a six-year primary and a three-year post-primary cycle. (Nine-Year Basic Education for All).

The Minister again expressed his concern about educational wastage (e.g. failures, repeaters and dropouts) at the primary level. He also reiterated the government's philosophy to extend the period of mandatory schooling up to the age of 15 (which coincides with the apprenticeship age) which would ensure that all children could get at least a nine-year basic education to help them cope with day-to-day life and with the changing world of tomorrow. The reform of basic education and the need for education up to age 15 appeared on the agenda and was endorsed as a Green Paper by the Cabinet.

The Nine-Year Basic Education for All Reform became the pivot around which all other issues would have to be considered: i.e. those related to policy formulation, curriculum, pedagogy, resource allocation, and utilization.

The philosophy behind the Master Plan and its general aims are summarized in *Figure 1*.

Structures and procedures for the Master Plan preparation

The overall setting

Three new structures were set up to formulate the Master Plan, and particularly, the Nine-Year Basic Education for All Reform: the *Steering Committee*, the *Working Group* and the *Sectoral Sub Committee*. Openness and popular participation were the driving forces behind the information flow networks created for this important task.

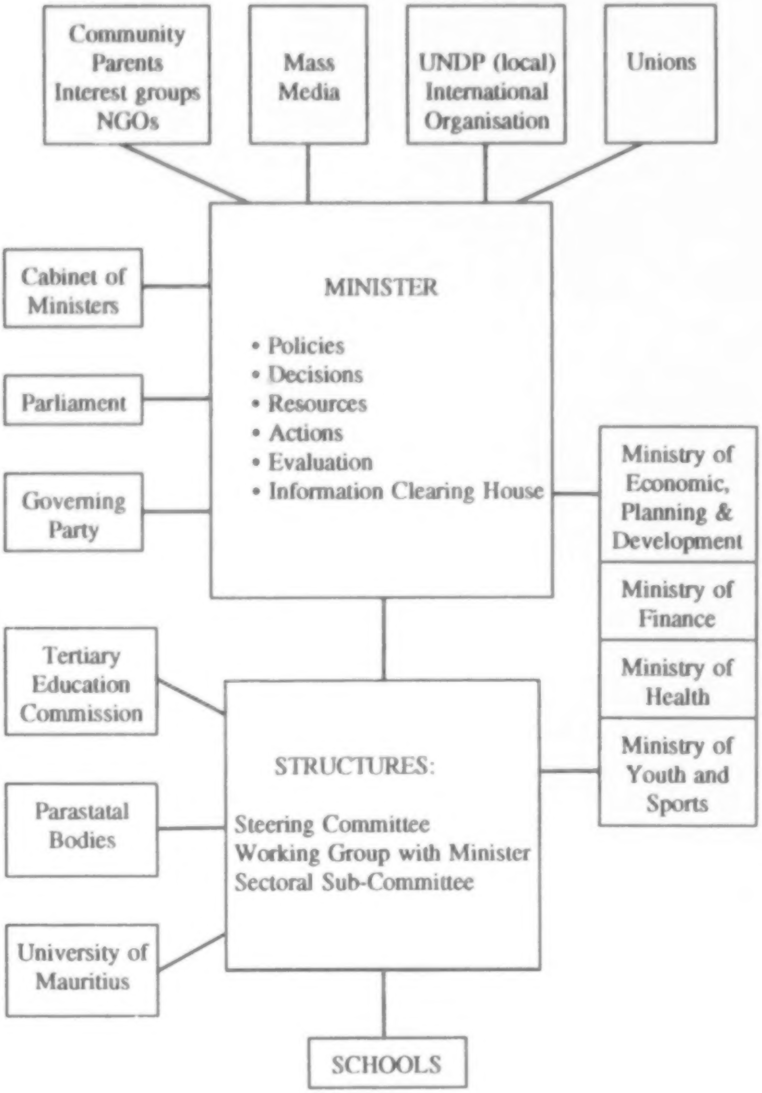
The functions of the *Steering Committee* were: (i) to establish a programme of work; (ii) to monitor progress; (iii) to determine the structure and methodology for the preparation of the Plan. It was chaired by the Minister and included the chief technical officer, the chairman of the various sub-committees, the directors of parastatal bodies, the chief education officer (Planning, Research and Monitoring Division), the vice-chancellor of the University of Mauritius, the director of the Management Audit Bureau, a senior member of the Ministry of Economic Planning and Development, the adviser to the Ministry of Education and Science, and the resident representative of the United Nations Development Programme (UNDP).

The *Working Group*, a sub-committee of the Steering Committee, was intended to be the main task force through its central role in the collection of information and the drafting of the chapters of the Plan. In particular, it was required to ensure the overall coherence of the programme and its relevance to the agreed objectives of the Plan.

The *Sectoral Sub-Committees* were to support the Working Group by collecting data and information pertinent to their respective sectors, prepare draft programmes and present them in a descriptive as well as in an analytical way. It should also be noted that the Minister entrusted a team of UNESCO experts to assist the Working Group and the Sectoral Sub-Committees in the preparation of the Master Plan.

The role of the Ministry of Education and Science is central in this reform process and in Mauritian education at large. The education act clearly establishes the overall powers, duties and functions of the Minister.

Figure 1. Information flow networks: the centrality of the Minister


Community
Parents
Interest groups
NGOs
Mass
Media
UNDP (local)
International
Organisation
Unions
Cabinet of
Ministers
Parliament
Governing
Party
MINISTER
• Policies
• Decisions
• Resources
• Actions
• Evaluation
• Information Clearing House
Ministry of
Economic,
Planning &
Development
Ministry of
Finance
Ministry of
Health
Ministry of
Youth and
Sports
Tertiary
Education
Commission
Parasteral
Bodies
University of
Mauritius
STRUCTURES:
Steering Committee
Working Group with Minister
Sectoral Sub-Committee
SCHOOLS

The Minister may delegate, if he wishes. But he has to control the system continuously and is the sole person responsible for education and, hence, accountable to the people of Mauritius through Parliament.

Over and above the law which sets the context within which the education portfolio functions, we have to understand the assumptions and habits of the elected official, i.e. the Minister, and those of the Permanent Secretary who is the administrative head, directly responsible for a large number of staff hierarchically organized. It is important, as well, to consider the expectations of the parents, the community and the larger society. It is within the long tradition of the Mauritian society, which is pluralistic in many ways (multi-racial, multi-ethnic and multi-lingual) to have as wide a consultation as possible to ensure that parents, the community and the society at large endorse the views of government. The minority groups are always given an opportunity to have a say in government according to the constitution of the country. In fact, Mauritius citizen tend to prefer to meet and talk directly and informally with their Minister.

Involvement and contribution by various actors

The deliberations of the Steering Committee, the Working Group and the Sectoral Sub-Committee signified important changes in the working habits of the Ministry of Education and Science. Ministry officials now had to collaborate not only with their colleagues in other divisions but also with those outside the Ministry, i.e. staff of parastatal bodies and overseas consultants. This new situation may also contribute to attitudinal changes among Ministry staff.

Furthermore, new pressure groups, the mass media and Non-Governmental Organizations (NGOs) emerged to express their views on the reform of basic education. A few lobbyists and the print media raised several issues concerning such things as Certificate of Primary Education (CPE) failures, private tuition, the language issue, the teaching medium and the quality of education in general. Some of the vested interests who participated at committee meetings largely failed to suggest the probable lines of action. But still they represented a force and, through the print media, kept the public abreast of what the government was doing. Since some of these pressure groups have no responsibility for actual programme implementation, they were under less pressure to be practical or constructive. More significant pressure groups like the teachers' unions, which did share in programme implementation, did not demonstrate at any stage that they would be accountable if things went wrong. Much of the information used by both types of pressure groups was not based upon systematically collected evidence but simply reflected the general views and opinions of the larger society.

To sum up, though all decisions implying major changes or reforms in the domains of policy, resources, legislation and inspection are still in the hands of the Minister (as set out by the Education Act and the regulations governing the education portfolio), it is evident that the reform of basic education represents a unique event in the history of education in Mauritius. It does signify a growth of opportunities for participation and consultation in education.

The existing information base revisited

A major difficulty in embarking on the formulation of the reform of Nine-Year Basic Education for All was the inadequacy and limited *relevance* of the existing information system as a basis for designing and directing action. It was considered essential to develop the appropriate strategies and modalities to acquire the pertinent information necessary to understand the prospects and implications of such a reform. The missing link between information and effective decision-making was noted at different times during the process, senior officials commented upon the confusion and frustration involved in attempting to decide major issues in education without sufficient knowledge.

At the initial stages, several types of information had to be gathered and interpreted at different levels, *viz.* the Steering Committee, the Working Group, the Sectoral Sub-Committee and the various divisions of the Ministry, which involved different administrative tiers. The four main types of information needed were:

(i) Assessment of the *organizational* structure, including the role of the principal actors and the major power relationships. The last significant attempt to reorganize Ministry's structure was based on studies conducted by the World Bank Consultancy Team as defined in the 'Manual for Reorganization Procedures', May 1981. Some incremental changes have taken place since then but they were not systematically evaluated or recorded. While missions from international organizations (e.g., UNESCO, UNDP, UNICEF, ILO, World Bank, African Development Bank) have conducted appraisal studies of different sub-sectors, those rarely touched the Ministry's overall structure.

(ii) Information on the *socio-economic and technological* resources required to institute the proposed change. With the advent of a deliberate new governmental policy framework for rapid industrialization, significant changes in the socio-economic setting have occurred as expected. The Ministry of Economic Planning and Development has drawn the attention of Government to important socio-economic and technological indicators. However, since little emphasis was paid to the educational sector, such information has not been used much for educational purposes.

(iii) Information on the *political* context in which the educational change was expected to occur. For example, while this plan of reform was being drafted, the general election in Mauritius was fixed for the 15 September 1991. Prior to this election, there was a new political alignment and it was not possible to foresee the impact that arrangement could have on the educational system generally and on the reform of Nine-Year Basic Education for All.

(iv) *Theoretical* and *empirical* information of how equity, quality and quantity could be achieved. The elusive triangle of equity, quality and quantity was perceived to be the ideal towards which education would have to proceed. No doubt, available information in the MES and the Statistic Section on students performance at the three main examinations, as well as data on school buildings and furniture, teachers, and finance overwhelmingly demonstrate the discrimination and disadvantage that students have to face. However, equally important qualitative information about the background of students (parental education and income), parental attitudes, and educational expectations are generally lacking.

These four types of information, i.e. (i) organizational, (ii) socio economic-technological, (iii) political, and (iv) theoretical, constituted basic requirements for embarking on the reform enterprise. Furthermore, some data and information considered very sensitive within a multi-cultural setting like Mauritius, such as data on regional, ethnic, and socio economic differences in educational performance, had to be utilized and disseminated at various meetings with extreme caution.

It was argued initially at one of the informal meetings of the Minister with the Working Group that decisions had to be based on a wide range of information, interpretations, and views. The statistics section functioning under the aegis of the planning division (although acting as the clearing-house of all information of the Ministry), was believed to fall short of the mark. The information from this section was not organized to be readily available for decision making. For example, statistics on school performance at the CPE were not analyzed to show the reasons for between- and within-school differences. At different times the Minister expressed his concern about the unavailability of critical information for the Plan. This concern was also endorsed by the Working Group, which thought that the new structures, if set up to function properly, would provide a large amount of information. In this context, a press release was issued to initiate suggestions from the public at large (to be followed by a series of brainstorming sessions). Additionally, a special letter was addressed to some 30 educators and educationalists calling opinions on matters related to educational reform in the country.

This assessment of information needs was intended to enable the committees: (i) to appraise the committee members on the existing situation; (ii) to adjust the utilization of existing and potential resources; and (iii) to look at the possible options capable of effectively and efficiently transforming the educational system in the short and long term.

The process of gathering additional information: formal and informal approaches

The new structures, i.e. the *Steering Committee*, the *Working Group* and the *Sectoral Sub-Committee* were supposed to generate a wide variety of data because they contained members who were most knowledgeable in their different educational capacities. However, even when these structures worked effectively and efficiently, it was still necessary to supplement and agitate information through a wider consultation across the nation. Consequently, the Working Group, changing its strategies on the way, adopted a contingency approach to the collection of data pertinent to the Master Plan. One strategy was to consult the *forces vives* at a brainstorming session.

The *forces vives* represent the views of the general public. These views do not necessarily replace existing statistical data, but may help to confirm (or oppose) and clarify some information resulting from more conventional, formal data gathering. Furthermore, through consultations, it was possible to sensitize the *forces vives* regarding information that the public might initially reject in the absence of further explanations. The consultation session was held in June 1990 under the aegis of the Working Group. It was well attended by a wide cross-section of the Mauritius population. The purpose of this particular session was to identify some of the major issues in education as seen by the community and to design strategies for addressing these issues. The most active at the session were the heads of schools and colleges, unions, religious bodies, parents, Parent-Teacher Associations (PTAs), current and retired educators and educationalists, businessmen and farmers.

The brainstorming session clearly demonstrated the frustration and dissatisfaction that existed in the educational sector. The headmasters were of the view that the schools were not run in the most efficient and relevant way, mostly because of a tendency to maintain the colonial type of approach. They also expressed their general dissatisfaction concerning the use of resources and underlined the low level of motivation and professionalism among the teaching staff. Teachers, the key actors in the teaching-learning process, were not giving their best effort and, hence, the education system could not be improved. However, some were of the view that the teacher training programme designed by the Ministry of Education and Science was unable to improve teacher skills or change teacher attitudes. Others were of the opinion that the curriculum was not relevant enough to make the life of the average child an enriching experience at school. This would explain, at least partly, why over 30 per cent of the children drop out of the system at CPE.

It was also forcefully argued that the support given to the schools from the central Government was generally inadequate. This led to a discussion on the role of the education portfolio. It was fiercely argued that policies and political will were essential for a change in education. This was the general stand taken at the brainstorming session. The question of decentralization of activities, devolution of power and authority, and greater freedom at the school were argued to be dependent not only upon the extent of political will, but also on the availability of resources and properly qualified personnel. Thus, the trade-offs between centralization and decentralization were discussed, but it was not evident which activities should be decentralized.

Working towards a Nine-Year basic education for all reform

The early phase of the reform preparation

The Working Group was to be responsible for the first draft of the topics to be covered in the Master Plan (presented in *Appendix I, page 198/199*). The list drafted by the Working Group was based on the experience of the members, on the deliberations of the Workshop at the Mahatma Gandhi Institute (MGI), as well as on the submissions of different drafts on various sectors of education, but specifically on the brainstorming session (June 1990). For example, the results from the workshop at MGI were used: (i) to improve the various drafts that have been submitted for discussion; (ii) to prepare a proposal for modifying the organizational structure of the Ministry of Education and Science; and, (iii) to include a proposal for the reform of the existing inspectorate. According to the general work plan which received the blessing of the Minister, the Working Group was supposed to:

- prepare a first draft of about ten pages on each topic allotted by the Minister to each member of the Working Group, drawing not merely on written materials but also on interviews with senior officials of the Ministry, the parastatal bodies, the University, the Private Secondary Schools Authority and the head teachers, teachers, and PTAs. Members could also consult other significant participants of the Plan, such as international experts from UNESCO, the ILO, the World Bank and the African Development Bank.

- present an amended draft of each study to the Minister for his concurrence, and have the draft circulated by the secretary of the Working Group to all members of the Working Group, the Steering Committee and to other persons whom the Minister would consider relevant.

- make a thorough critique of all the drafts at the working session (all co-workers were advised by the Minister to have frank and full discussions on all issues raised and arrive at consensus to enable further progress of the Plan).

- produce the final draft for further discussion with the WGM, and present issues requiring policy decisions at the Steering Committee, before submission to the Cabinet of Ministers.

The result would be to have a series of study papers covering: (i) the structure and organization of the Ministry; (ii) nine-year schooling for all; (iii) pre-primary, primary, secondary, and tertiary education; (iv) regional educational centres and decentralization; (v) teacher education and teacher status; (vi) curriculum, community links, health, adult and continuing education; (vii) international and regional co-operation; and (viii) examination, continuous assessment and remedial education. These study papers would then be presented to the WGM with the appropriate amendments and would be readily available to all the members for further observations.

Fine-tuning and further consultation practices

The Cabinet Memorandum

The actual operation of the workplan, including the adoption of the terms of reference, went fairly well. The members of the Working Group kept an open and flexible mind to cope with contingencies and were prepared to modify the structures should they not work well. The most important change concerned the extension of the Working Group to include a larger number of additional members and to be chaired by the Minister (WGM). It replaced the Steering Committee.

The strategies and modalities used in the preparation of the Mauritian Master Plan for Education by the year 2000 are examples of how conflicts can be optimally managed to bring about a national consensus for a Nine-Year Basic Education for All Reform. *Appendix II, page 200/201*, provides a chronological summary of the various activities and decisions that surrounded the preparation of the Master Plan and the mechanisms created to maximize these strategies for information gathering, consultation and decision-making. A preliminary outline of the Master Plan was circulated at the third WGM meeting in September 1990 and, among other topics, the Nine-Year Basic Education for All appeared prominently. Also circulated was a draft Cabinet memorandum on nine-year schooling. UNESCO consultants were also present and participated in the discussion of the draft. Discussion centred on the implications of proposed changes – in finance, infrastructure, teachers, the Roman Catholic Education Authority (RCEA), and personnel within the educational structure. Fierce opposition to the proposal came from the tertiary institutions, namely the Mauritius Institute of Education (MIE), the University, and the Mahatma Gandhi Institute (MGI) at this proposal. It was necessary, then, that the proposal be thoroughly debated in the Working Group and at seminars. A proposal for a seminar on Nine-Year Schooling was accepted by the Minister, who further suggested that an agenda be developed and that all parties concerned should be invited to participate in the seminar.

At the fourth WGM meeting on the issue of Nine-Year Schooling, the cabinet memorandum was further discussed. The Minister proposed that the cabinet memorandum, being a highly confidential document, should not be presented to the Working Group in the form of a cabinet memorandum but rather in the form of an information paper. At the fifth WGM meeting in which the issue of Nine-Year Schooling System was again on the agenda, a preliminary draft, in the form of an information paper on this issue, was debated. Fierce opposition came from the MIE, MGI, the Working Group members, the RCEA and unions. The situation forced the Minister to set up a sub-committee on nine-year schooling. The Minister asked that all implications be thoroughly discussed by that Committee to enable a final decision to be taken and the Cabinet to be informed accordingly.

In October 1990, the seventh WGM meeting discussed the draft paper submitted in the Sub-Committee paper on restructuring of the school system leading to *nine-year basic education for all*. Several important observations were made and some major implications were considered (discussed below). In November 1990, at the eighth WGM meeting, a revised draft of the cabinet memorandum on Nine-Year Basic Education for All was presented. A green paper regarding Nine-Year Basic Education was agreed upon for presentation to Cabinet. Objections were raised specifically by the MIE and the Inspectorate on Standard III assessment for the purpose of segregating children. Such segregation at such a tender age, as happened in Singapore, was considered to be inhuman.

At the fourth Steering Committee meeting, which was their last meeting, the Minister discussed the green paper. There was a strong opposition from the MIE, MGI, the Mauritius Examination Syndicate (MES), the Mauritius College of the Air (MCA), and the Ministry's officials. But the Minister explained his problem concerning the large number of dropouts at CPE. For him, Nine-Year Basic Education for All would ensure more retention at school level and thus eventually reduce discrimination. This, he thought, was a fair statement of his stand. He further suggested that he would sound out his colleagues in Cabinet.

At the ninth WGM meeting, the Minister informed the group that the Cabinet agreed in principle to a Nine-Year Basic Education for All, but mentioned that cost implications had to be thoroughly worked out. He also brought to the attention of the members the fact that the mass media recently mentioned that the trade unions, parents and teachers had not been consulted, and that this innovation was not based on research or piloting. Consequently, the Minister proposed the organization of a national seminar on the proposed Nine-Year Basic Education for All in early 1991. The seminar was intended to have island-wide participation and consultation. Further, the Minister added that he was fully convinced that the results of research were not always appropriate for bringing about changes in education. He was accountable to Parliament and to the people and his immediate concerns were threefold: (a) how to reduce dropouts and wastage in the system; (b) how to make the system more human and ultimately drastically reduce discrimination; and, (c) how to retain the children for a longer period, i.e. up to the age of 15, which is the apprenticeship age. After the presentation and consultation, it was intended that the national seminar should come to a general consensus on the Nine-Year Basic Education for All.

The framework set for the national seminar included the structure, information base and processes, and the outputs relevant for the implementation of Nine-Year Basic Education for All. In March 1991 at the WGM meeting, a draft suggestion was made by the UNESCO team on the implementation of a nine-year schooling policy basically in line with the Minister's thinking.

Managing conflict of interests

The presentation of nine-year schooling at the different Working Group meetings was considered extremely important for the future of education in Mauritius. The following implications were considered: (i) The proposal that slow learners take CPE in seven or eight years in a multi-cultural setting would increase discrimination. (ii) Special training for teachers taking slower streams would be time consuming and costly. (iii) No agreement could be reached on whether CPE was to be refined to measure attainment of Minimum Learning Competencies (MLC) or not. (iv) There was no general agreement on continuous assessment and remedial education. (v) Form III national orientation assessment was controversial (this scheme had been proposed a decade ago and rejected). (vi) The Standard III continuous assessment scheme was pedagogically unsound. And, (vii) cost and resource implications in the structuring of the system were not worked out in a comprehensive manner.

In January 1991, a statement on the latest CPE results, presenting the glaring dropout figures, was circulated in Parliament. The Minister informed the Working Group that he was of the view that the virtues of Nine-Year Basic Education for All were so high that even the members of the Opposition in Parliament would eventually endorse his proposal. At the WGM meeting the same month, the Private Secondary Schools Authority (PSSA) submitted its comments on Nine-Year Basic Education for All Reform. It said that strong opposition would be made by the Roman Catholic Education Authority (RCEA) and that problems related to inspection and teacher training would crop up. The Minister agreed to organize a workshop on nine-year schooling on the 28 February, 1991 to have a more fundamental rethinking of this innovation.

Representatives of the RCEA were of opinion that the Master Plan should put greater emphasis on its recommendations to on the dual system of educational administration (governmental and government-aided schools) and therefore called upon the Supreme Court to reconsider the constitutional decrees governing such issues (La Vie Catholique, July 12, 1991). The mass media (newspapers and magazines) constantly drew public attention to the importance of teachers and the measures set to improve the teaching profession. However, the Government Teachers Union (GTU) argued that the Plan offered no career prospects for teachers and did not introduce much novelty although it was rich with good intentions (L'Express, July 12, 1991).

As mentioned earlier, the Nine-Year Basic Education For All Reform is a product of a long period of pessimism and scepticism in the 1970s and 1980s often reflecting the segmentation approach to a nationwide education reform. It has not been possible to create and maintain consensus from various segments of the Mauritian population for a common platform for such a reform, partly because of the factors external to the educational system (e.g. political, economic, social, cultural and demographic) and partly because of intrinsic elements of the system, more specifically those related to administration and management, the absorptive capacity of the education system, teaching-learning processes and the examination system. The present state of affairs regarding the reform of education in Mauritius should be considered before launching its implementation. Concomitantly, the justification of the Master Plan is based upon the possibilities of its implementation. A re-assessment of the feasibility of this Plan would need to wait but still the Plan is directive and includes some major implementation strategies.

The product: selected elements of the revised Master Plan

The standard of basic education to be reached by every child includes the attainment of literacy and numeracy skills and the development of attitudes conducive to the healthy growth of Mauritian culture and society. This central objective of the Master Plan for the Year 2000 should be met through the introduction of the nine year basic education school and by provision of pre-primary education for every child. The strategies adopted dwell on improved quality and efficiency throughout the educational system and reduction of inequalities. The Master Plan presents an impressive number of short- and long-term measures for each of these interrelated problem areas.

The present curriculum which is 'insufficient for children of high ability and expects too much from slow learners' will gradually be replaced so that in the future children will follow a curriculum appropriate to their activities and needs and have access to adequate learning materials and textbooks. The specification of the minimum standards and levels of achievement necessary in each subject matter and for each grade is a top priority of the Master Plan.

However, as long as the examinations at the end of each cycle, in particular the CPE, cover only a few 'key' subjects, the curriculum actually taught will probably continue to be narrow. That is why the Master Plan also proposed to change the evaluation system, so that other subjects and even co-curricular activities (i.e. sports and creative work) are taken into account in the regular assessments.

The special survey undertaken during the first months of the Master Plan preparation revealed deficiencies and substantial differences between schools as regards physical conditions and material provision. As a result, it was proposed that a minimum standard of infrastructure and equipment be established to ensure that each school would have a reading room, a staff room, a television-video room, a water tank, a telephone, a duplicating machine, and an electric power point in each classroom.

It was expected that the inequalities in the educational system will be combated by improving standards in low-achieving primary schools. The measures to be undertaken to combat inequality included both educational and social considerations, e.g., special care in posting head-teachers and teachers, allowances for an additional hour of teaching per day, reduction of maximum class-size for remedial classes, priority given to school inspection, and staff training, special awards to those low achieving schools making the greatest progress, visits of social workers to families whose children are frequently absent from school.

The Master Plan places additional responsibilities on the teachers. Teachers are expected to play a more active role in curriculum development in general and, more specifically, in adapting the curricula to the needs of their own pupils. They will be required to assess their pupils' progress in a more systematic way and develop remedial work to assist weak students.

A highly committed teaching force is central to any educational improvement programme. Since more is required from the teachers, the Master Plan also proposes measures to improve teachers' status, conditions of work, competence, and career prospects. Hence, for the appointment of teachers, new criteria will be adopted which will reflect aptitude and commitment as well as academic qualifications. At the primary level, the present two-year teacher's certificate programme of pre-service education will be replaced by a three-year course leading to a diploma in education. Two-thirds of the current primary school teachers need upgrading of their skills and by the year 2000 all teachers will have participated in in-service training courses. For reasons of cost-effectiveness (based on international experience) the in-service training will rely extensively on a distance-training scheme. Among the measures suggested to improve the career prospects of the teaching force were the development of (1) a human resources development unit to better plan the teacher supply, qualification requirements, training programmes, job mobility and career development; (2) a more comprehensive system of performance appraisal with clearer criteria for promotion; (3) the creation of special awards for meritorious work (dedication and professionalism); (4) improved opportunities for advancement for teachers holding additional qualifications; (5) creation of a substantial number of deputy head teacher posts; (6) training of school administrators; and, (7) more rapid reporting and filling of vacancies.

The high rates of failure in the examinations, especially at the end of primary education (the CPE), was a major driving force for reforming the educational system. It is therefore not surprising that the modes of pupil evaluation are given special attention in the Master Plan. The importance of the selection function in pupil assessment will be diminished and more emphasis given to the assessment of learning and use of remedial measures. The new evaluation system will be made up of three parts: (1) continuous comprehensive evaluation (CCE) monitored by the schools themselves; (2) national assessment programmes at Standard III and Form III, to be monitored by the Mauritius Examinations Syndicate (MES); and, (3) the CPE examination (administered at the end of Standard VI) and the SC examination (administered at the end of Form V) for certification and selection.

The CPE examination will be broadened and redesigned to make it a more valid and reliable measure of student achievement. The Mauritius Examination Syndicate will be charged with studying the impact of the new evaluation.

Conclusion

The formal policy conversion leading to a Nine-Year Basic Education for All was conditioned by the environmental context of Mauritius. Policy-makers had to deal with the amorphous context of reality within a democratic setting. Those individuals and groups close to the decision-making processes, like the Minister, the Permanent Secretary and the office-holders, faced constant difficulties in decision-making processes. The authors of this study have experienced the conflicts in and between the Working Group, the Sectoral Sub-Committees, and the Minister. These unique situations have not been properly documented in the normal note taking process of the various meetings. The intense internal struggle and strong opposition from some groups have not yet been reconciled. Inadequate communication, lack of information, and contradictory information at times have contributed to conflicting interpretations of the policy on nine-year schooling.

The Committees often did not adhere to clear procedures for articulating the conflicting interpretations of the policy or the differences in positions regarding nine-year schooling. The conflicts resulted in entrenched positions. It was noted clearly that when differences did appear, they were ignored by the chairman of the Working Group; at times they were suppressed, overlooked or regarded as evidence of lack of understanding of the policy. Genuine differences of interpretation or opinion regarding the policy were usually not aired or resolved. The necessary communication among the various parts of the Working Group did not always take place. Conflict was not considered a normal aspect of the administrative process. The Minister would always step in to ensure that conflicting situations were resolved as fast as possible. Conflict left many issues unresolved, and some members of the Working Group became increasingly committed to their positions. In some cases, members attempted to manipulate information to fit their particular needs and goals.

The important shift introduced by this reform process, however, was to move educational policy making from the close province of the professional educators to a more open forum involving parents, vested interests, lobbyists, unions and the community at large. This presented a major challenge to the professional educators. The articulation of needs, ideas and interests of the parents and the community and the inclusion of a broader spectrum of citizens in the discussion and determination of policy regarding the futures of education were significant developments. At the same time, the professionals were of the view that there was inadequate planning and little thought given to the implementation of basic education at the time of policy formulation. This resulted in confusion and frustration among the professional educators in the Working Group.

The professional educators tended to assist in the development of policy in a rational way based on their own experience, intuition, and the data available to them. When their data were questioned, principally by the Minister, the authority of the professional educators to assist policy decision regarding nine-year basic schooling was challenged. Consequently, the degree of rationality that existed in the process declined.

The organization and management of the Ministry required reform, for it was posited that organizational effectiveness was necessary for the improvement of educational quality and the implementation of a Nine-Year Basic Education for All initiative. This organizational reform meant reorganizing the administrative practices and reallocating priorities within a highly complex system. Existing practices and traditional arenas of power were resistant to change, especially when the changes threatened professional boundaries. The difficulty of making adjustments in the existing administrative processes was clearly evident.

It was also evident that the Ministry could not perform its role effectively without the co-operation and co-ordination of the parastatal bodies, the University and the schools, as well as parents and the community at large. The intent of the Ministry, then, was to act as a catalyst in getting the inspectorate, the schools, the parastatal bodies and parents to implement the reform of Nine-Year Basic Education that was formulated within the Master Plan.

The present case study provides some insights as to how the political environment and the modalities for information gathering, consultation, and decision making interacted in the process of preparing the national Master Plan for Education. The process illustrates the rather limited role of analytical knowledge in the process of formulating an educational plan through a process of nationwide consultation.

Nationwide participation alone may not always provide the information required to prepare a Master Plan for Education. As suggested in this case study, Mauritius did not have an effective Education Management Information System (EMIS) to serve the decision-making process. The conventional information base consisted mainly of poorly organized data sets related to school population, infrastructure, school places, problem teachers and headteachers, and remedial education practices. There was a lack of specific kinds of data, such as performance indicators on the quality of education. At the same time, much of the data reported by the inspectors and the statistical section of the Ministry were not fully analyzed or widely disseminated even within the Ministry. The reason was attributed mostly to a shortage of people capable of interpreting the results and translate the findings and suggestions into action programmes. Even the Working Group found it difficult to make sense out of the surfeit of available data. However, the Master Plan provided an opportunity to systematically gather some of the information regarding critical aspects of Mauritian education.

The task of collecting, processing, interpreting and communicating educational statistics to decision-makers is a difficult one. The personnel at the Ministry have to be trained in such domains. Likewise, the school level personnel who assist in the collection of data are generally untrained for such functions. Much needed information on determinants of students' performance has not been systematically organized. However, in the absence of an effective EMIS in Mauritius, the preparation of the Master Plan for Education and, in particular, the reform of Nine-Year Basic Education for All relied mostly on a process of continuous consultation and feedback among the important stake-holders in the educational system. The Minister and other members of the Steering Committee and Working Group were very sensitive to the criticisms from the media, educators and parents in general.

Participation and consultation aimed at reaching a national consensus was achieved by (1) creating the Steering Committee, the Working Group and the Sectoral Sub-Committees comprising members from different sectors of education working together with international consultants from UNESCO, UNDP, ILO and the World Bank; (ii) consulting with the Cabinet of Ministers, Parliament, schools through the 'Journée de Réflexion'; (iii) conducting conferences, workshops, seminars, brainstorming sessions and meetings at different phases in the preparation and finalization of the Master Plan for Education; and (iv) conducting school visits, questionnaires to students, and public memoranda. The opportunities given to stakeholders to prepare, discuss, and fine-tune various drafts of the papers submitted for the Master Plan for Education contributed to the quality of the final document.

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Appendix I. A brainstorming session: the strategic issues

	Retention by Working group	Incorporated in the Master Plan
Government will		
Government policies		
Ineffective decision-making		
Inequitable resource distribution	x	
No clear objectives	x	
Poor implementation	x	
Time lag		
Teaching-learning process		
No minimum learning competencies	x	
Curriculum enrichment required	x	x
Improved standards required		
Better access required	x	x
Poor support materials	x	
Poor support from Ministry to schools	x	x
Ineffective Inspectorate Service	x	x
Career Guidance and Counselling		
Staff Development	x	x
Teacher's status to be raised	x	x
Regular upgrading courses	x	x
Continuing education		
Better pay	x	x
New recruitment procedures		
Administration and Organization		
Nationalization of secondary schools	x	x
Decentralization	x	x
Effective regional education centers		
Abolition of automatic promotion	x	x
Certification and assessment to be improved		
Infrastructural standards	x	x
Raise standards of schools	x	
Flexible infrastructure	x	x
New sports facilities	x	
Multi-purpose use even by the community		

Appendix I. (continued)

Research		
Action-based Research	x	
a) at school level		
b) at University Level	x	x
c) at Ministry level		
Data Bank created at Ministry	x	x
Dissemination of information though information networks to all institutions	x	
Linkages		
Networking among schools	x	
Regional Co-operation	x	x
International Co-operation	x	x
Community participation	x	x
New alliances	x	

Appendix II. Working towards a nine-year basic education for all

PRELUDE TO THE PLAN (1990)

Date	Events	Activities	Information Flow
1990 March	Jomtien World Conference on Education for All	Information Paper approved by Cabinet	Public informed by mass media
April	Cabinet Memorandum announcing preparation of Master Plan	Cabinet concurs	Public informed by mass media
April/May	Workshop	Analysis of education system Focus on Organization and Inspectorate. No specific proposal.	Public informed by mass media. Further discussion planned.
June	Press Conference by Minister	Announcing preparation of the Master Plan.	Public informed by mass media.

THE PROCESS

June to September	Steering Committee (four meetings) chaired by Minister and attended by all sectors of education.	Strategic planning: time-frame, international assistance, organization of work, objectives of Master Plan, nine year schooling and consideration of Ramdoyal's Report, preliminary outline of Master Plan.	Mass Media reports.

Appendix II (continued)

PRELUDE TO THE PLAN

Date	Events	Activities	Information flow
1990 June to September	Working Group (11 meetings) co-opted foreign consultants and other educationists.	Responsible for 1st draft. Cabinet Memos on: equipment needed. Plan progress, foreign assistance. Project Document. Brainstorming session. Letters to educationists and the community. Memoranda from public. Questionnaire on technical subjects. Journée de réflexion.	Press release inviting views from public. Brainstorming session. Letter under Minister's signature to selected persons. Questionnaire on options on science and technical subjects sent to secondary schools. Memoranda from public. Result of survey on science and technical subjects. Discussion on issues coming out from brainstorming teaching-learning process, decentralization, regional consultation etc.
September	Journée de réflexion in schools. (Rectors, teachers, pupils).	Proposal made on reform of the education system.	Considered in Master Plan. Reported by mass media.

Chapter 9

Information technology in the organization: lessons from private education development in Haiti

Anthony M. Cresswell
State University of New York at Albany, USA

Karen Tietjen
Learning Systems Institute,
Florida State University, USA

Antoine Levy, Vanya Berrouet
Haitian Foundation for Private Education, Haiti

Background

Information systems and their related technology can be powerful, but not necessarily reliable tools, in improving educational planning and development. While the basic concept of their potential has been accepted for some time – leading to a growing body of literature and experience concerning educational management information systems – it is equally clear from experience that the potential positive effects of information systems are not routinely obtained (see Ross ; Mählck, 1990).

The use of information systems and technology in organizations generally – and in educational development efforts in particular – is essentially a quest for greater productivity. The need to make the most of dwindling educational development budgets creates considerable pressure for the more efficient use of scarce resources. Achieving these efficiencies requires, among other things, the information necessary for good management and decision making. Obtaining this information – and presenting it in a useful form – is a complex technical and organizational task (Windham, Levin, and Bathory, 1990). How the organizations deal with that task is the subject of this chapter.

In this chapter we explore the record of information technology applications in an educational development project in a search of insights into the organizational strategies that can account for varied levels of success[1]. The premise of this exploration is that the uneven record of success in using information management technology in educational planning and development can be accounted for in large part by the interactions between the information system and the larger organization in which it is used. To illustrate these interactions we present here a detailed case study of the information systems and technology applications in an educational development project in Haiti.

The Incentives to Improve Basic Education (IIBE) project, created to improve private primary schooling in Haiti, offers an unusually rich opportunity to explore the linkages between information technology and the organization in which it functions[2]. First, both the nature of the project and its setting are unique. Its strategy involves a complex programme of incentives, research, and support services administered by a non-governmental organization created expressly for the task. Unlike many developing countries, responsibility for providing primary education has fallen mainly to the private sector in Haiti, and a national-level institution was needed to forge links between private schools, co-ordinate policy issues, and represent the private sector to both the government and donors. By examining the IIBE project, we can learn about the operation of information systems and technology in an educational development organization created, literally, from scratch.

Second, the development of the IIBE project relies on information technology as an important part of its management and operations. Although this was not an explicit part of the project's design, the creation of an information system appears to be a natural – even necessary – response to the demands placed on project designers and staff. As a result, the IIBE project provides a number of informative examples of both successful and somewhat unsuccessful applications. Most importantly, it demonstrates the development process of information technology applications, which can inform the information system planning process in similar contexts.

The basic assumption guiding this inquiry is that information systems and technology applications can be made more useful in

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1. The data on which this chapter is based come primarily from the direct participation of the authors in the project and from interviews with Project staff. The authors are, respectively, information systems consultant to the project 1987-90; Project Manager, 1987-90 and Research Coordinator, 1990; Head of the Evaluation Services Team, and Head of the School Administration Team.

2. The Project, sponsored by USAID, actually is known by three names: its official title is "Incentives for Improving Basic Education (IIBE)"; in Haiti it is known as PROBED (or PWOBED in Creole): "Projet Bilateral d'Education"; or by the name of the Foundation which now operates it: FONHEP.

organizations if we understand the way the organization responds to, adapts, and uses the technology, and vice versa. We do not limit our view of information technology applications to full management information systems. Instead we use the broader term of information technology applications to include any computer-based information processing tool – from spread sheets or word processing applications to organization-wide management information systems. In general, the focus is less on any particular application and more on how it relates to the organization's structure and operations.

This chapter is organized in the following way. Our analytical approach is described in the next section and followed by a description of the project. We then examine the development of its information systems and technology applications, interpreting the results in terms of interactions with the organization's structure and dynamics. In the final section, we draw some generalizable lessons about information technology applications and their development within an organizational context.

Organizational view of information technology applications: an analytic model

Four key points emerge from the literature on information technology and systems:

(i) there is an interaction between the organization and the technology;
(ii) organizational structure conforms to information processing demands;
(iii) the constantly changing environment of the organization may require invention of new information technologies, but does not always lead to innovation, i.e. adoption of inventions; and
(iv) information technology and systems are shaped by organization conflicts and constraints.

In his review of studies of the technology-structure connection Scott (1990) points out that studying this relationship is a bit like wielding a two-edged sword:

> "Thrusting in one direction reveals the impact of a given technology on organizational structure and performance. The counter thrust emphasizes that organizational structures vary in their capacities to appropriate or generate new technologies" (p. 109).

The following analysis of the IIBE project employs both edges of the sword, in that we are concerned with interactions. Our approach is further informed by Galbraith's (1973) treatment of information processing in terms of contingency theory. He identifies interdependence, complexity, and uncertainty as reflections of the underlying information processing demands on an organization. The structure of the organization, in Galbraith's argument, develops to cope with these demands. And by extension, if the structures are shaped to one set of information processing demands, they may work less well for other ones.

The organizational setting is also seen as a dynamic environment. There is a steady flux of change in the information processing demands and corresponding attempts to adapt and invent new techniques. The change attempts are instructive as illustrations of how the organizational factors can shape the attempts to change the technology. The perspective we use here derives most directly from Stinchcombe's (1990) treatment of technological invention and innovation. He expands considerably on Schumpeter's (1942) distinction between an invention and an innovation, but from the perspective of a competitive advantage in a market environment. While the context is somewhat different here, the same principles apply in this micro-setting. The point is that an invention (new product, technique, etc.) does not always lead to a successful innovation.

> "Turning inventions into innovations is difficult because innovations need a particularly complex information and decision system connected to them to become innovations (Stinchcombe, 1990, p. 153)".

This perspective emphasizes the broad view of the invention's place in the organization, rather than a narrow focus on the technical details of the invention itself.

Changes in information technology are also seen as linked to what information is available and thus to shifting demands. As Zuboff (1985) illustrated, automating a processing task in an organization affects the information content of the task itself, and of what information is available elsewhere. For example, a computerized accounting system imbeds accounting technique in the software and can reduce or eliminate the need for accounting knowledge in the user. At the same time, it can informate a process, by making available more information about the accounts than the previous methods.

Organizational conflicts and constraints can also play an important role in shaping the development of a technological innovation. Structural features of the organization such as status hierarchies, high levels of formality, or centralized control can affect the way information is processed and the technology applied. Institutional arrangements, organizational politics, and strongly vested interests can act as constraints as well (Davis ; Taylor, 1976). We will also be concerned with more direct resource constraints, such as limited budgets, or infrastructure problems characteristic of poor or lesser developed countries.

Project setting, strategy and a design dilemma

Project setting

The way information technology applications work in the IIBE project is influenced by the organization's design objectives and its political setting. These are tied directly to its private sector emphasis. During the project design period (1984-86), USA foreign assistance policy began to focus on private sector development generally. In Haiti, the political instability and corruption of the Duvalier Government made private sector development efforts particularly attractive. Further, as the Government had historically supplied relatively low levels of support to primary education, the private sector had become the major provider of primary education in Haiti through foreign missions, local churches, communities, private organizations, and entrepreneurs. Today, there are approximately 3,000 private primary schools in Haiti, enroling nearly 70 per cent of the primary school pupils nationally.[3] Schools fall into three groupings – those supported by the Catholic sector, by the Protestant sector and by the 'Independent' sector (i.e. schools with no church affiliation, run by communities or as for-profit concerns). Inverting the normal perception of elite private institutions, Haitian private primary schools exhibit some of the worst problems of poverty, inadequate resources, and low achievement levels in the Western hemisphere.

Both the project's impetus and design derive from the results of an education sector assessment completed in 1986 (Government of Haiti, 1986). That assessment reported widespread, serious deficiencies in Haitian primary education, many of which were related to the poverty, diversity, redundancy, and lack of co-ordination in the private education sector. The general disorder suggested a need for a central institution with the will and resources to play an effective co-ordinating and support role. Creating such an institution and providing effective, immediate support to resource-poor schools, consequently, became the dual goals of the IIBE project, initiated in 1986.

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[3] Precise statistics on private schools are difficult to locate. These estimates on proportion of private enrolments are from World Conference on Education for All. *Meeting basic learning needs: a vision for the 1990s - background document*. New York: Inter-Agency Commission for the World Conference on Education for All, UNICEF House, 1990.

Project strategy

Project strategy is based on providing sufficient incentives and support to (1) improve the quality of private primary schooling in rural and disadvantaged urban areas; and (2) enlist private sector co-operation and participation in building an indigenous co-ordinating institution to promote private sector educational development.

At the school-level, the project offers an attractive – but experimental – package of educational materials, training, and other support services to a sample of 300 private primary schools (approximately 10 per cent of the total), representing 60,000 students. To obtain these resources, the school enters into a reciprocal performance contract with the project, in which the school promises to effect quality improvement reforms in exchange for the project support package.

The performance contract is intended to ensure that resources used for school support are producing the desired results: "improve the quality of instruction, administrative efficiency and equity of access in private schools serving rural and depressed urban areas..." (IIBE project, 1987).

It also requires a rational administrative mechanism to control allocation of the materials and services so as to achieve these goals, as well as to monitor and evaluate on both a formative and summative basis the degree to which the quality improvement goals are being met.

Institution building was an important part of the initial project implementation (1986-1989) which was entrusted to an AID contractor, Florida State University (FSU), and two Haitian sub-contractors, representing the Catholic and Protestant sectors. The Independent sector, with no counterpart organization, became the focus of project institutional development efforts and a Haitian co-ordinator was added to project staff in 1987. Project management oversight was exercised by a Project Administrative Council (PAC) – consisting of leading Haitian Protestant and Catholic educators – which set policy and determined budget decisions. This early and central involvement of Haitians in project development helped build a grassroots constituency and network of private primary schools to both benefit from and support a local co-ordinating entity. The involvement also promoted an implicit goal of the project institutional development efforts: to devolve full management responsibility for school support to the local sub-contractors by the end of the project (1992). Thus the incentive paradigm was also applied to institution-building activities: the prospect of taking control of project resources was seen as additional motivation for the Haitian counterpart organizations to succeed in its institutional development efforts.

The IIBE project progressed rapidly in meeting its institutional development objectives. In 1989, a national-level institution, Haitian Foundation for Private Education (FONHEP), was legally established by the Protestants and Catholics, and control of the school support and institutional development components of the project passed to FONHEP under a new grant from USAID. Responsibility for the school research component remained with FSU, which would continue to provide technical and management expertise as required to FONHEP. With management control now lodged with a single local institution (under considerable scrutiny by AID and other donors) and the initial round of research and evaluation data collected, development of project management and information systems assumed new urgency. This chapter examines the evolution of information technology applications throughout the life of the project, from initial experimentation with information systems to current attempts to refine their operation.

Conflicting design goals

On the surface there is nothing particularly problematic or illogical about the project's basic strategy. An examination of the organizational implications of these tandem goals (a) institution building and development, and (b) rational administration of incentives and school support, however, reveals important potential conflicts. In fact, the kind of organizational style or design required to effectively pursue the first goal would be quite different for the second.

The institution building and development goal implies a political, entrepreneurial organization design. The private schools are sponsored by many different religious denominations, community organizations, and local entrepreneurs, and have a bewildering range of control and financial arrangements. Getting commitment and co-operation of such a large and diverse group, with histories of independence and competition, requires diplomacy and careful organizational development. This implies a slow, organic process of cultivating relationships, negotiating conflicts, and building trust. Success at this sort of task needs an organization with flexible rules and procedures, relatively high autonomy, and careful attention to informal information flows, especially from outside the organization.

The second goal – rational administration of incentives and school support – requires both the control and evaluation mechanisms associated with a more professional and bureaucratic organization design. The educational and research tasks require extensive professional training and expertise. Systematic monitoring and evaluation design requires standardization of definitions, information flows, and operating procedures. Consistency, reliability, and formalization of information collecting and processing assume greater importance. To complicate matters, both the contractor (FSU) and the sponsor (USAID) have extensive, detailed rules and requirements for accounting and operational reporting. Success at both administration and accountability tasks requires an organizational design with fairly rigid rules and procedures, more centralized control, and provisions for formal, systematic information processing and control apparatus.

Such conflicting expectations within organizations are not uncommon. Departments of the organization which deal more with development or shifting environmental demands usually conflict with other departments responsible for standardization or control. In manufacturing corporations, for example, the sales division's concern for responding to customer demands typically conflicts directly with the production division's need to standardize. By looking at the structure of the organization and the related information technology applications, we can learn how the organization copes with this normal tension.

Information technology applications

This section details the various applications of information technologies in the project. It opens with a brief overview of project organization and technology needs. It then examines the uses of technology and problems encountered in major areas of project activity: sectoral services, project accounting, personnel administration and office management, school accounting, school materials ordering, and monitoring and evaluation.

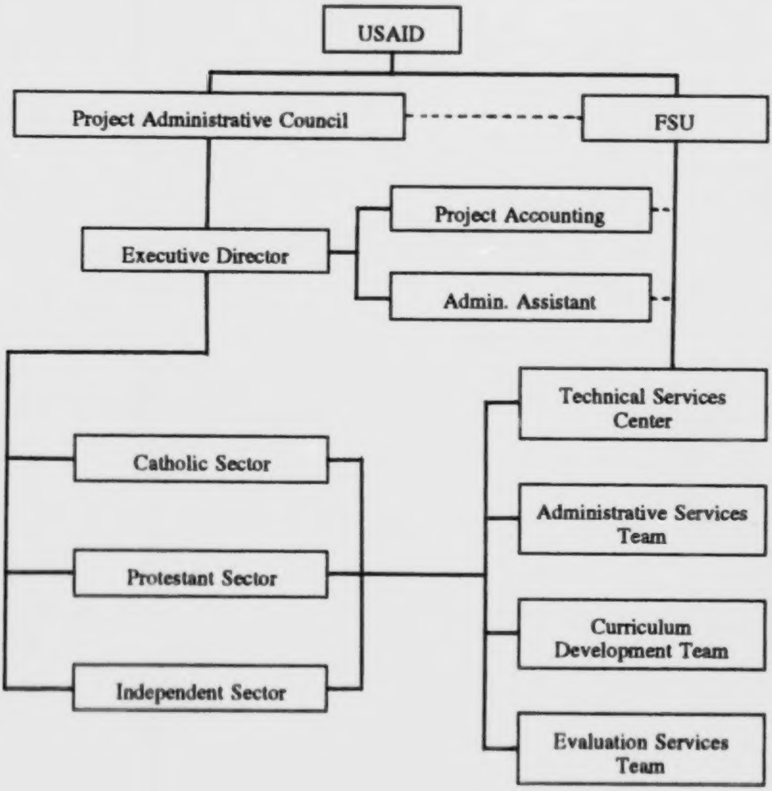
Information technology needs and relationship to organizational structure

Both the organizational structure and information technology applications of the project directly reflect its dual goals of institutional development and rational management of school support. The simplified organizational chart presented in *Figure 1* clearly juxtaposes the parallel structure that corresponds to these twin objectives: the *Sectoral Services* are concerned with institutional development and constituency building, while the *Technical Teams* focus on school support. It should be noted that the complexity of the management structure of the IIBE project defies accurate diagraming, which cannot capture the spirit of cooperation between the two individual organizations – FONHEP and FSU – responsible for the project.

Consequently, *Figure 1* presents a simplified version of the current management structure.

Sectoral Services (i.e. Protestant, Catholic, Independent) are primarily charged with the institution-building effort: recruiting and organizing the sector participants (i.e. schools), developing membership, managing the political relationships, and resolving conflicts and misunderstandings arising from the school performance contracts.

Figure 1. Project organizational structure


USAID
Project Administrative Council
FSU
Project Accounting
Executive Director
Admin. Assistant
Technical Services Center
Catholic Sector
Administrative Services Team
Protestant Sector
Curriculum Development Team
Independent Sector
Evaluation Services Team

The *Technical Teams* (TT) are responsible for administering the delivery of school support: ordering and delivering materials; developing teacher training modules, curriculum support and instructional materials; and monitoring and evaluating school, teacher and student performance to determine the most effective combination of school inputs.

While the Sectoral Services report to and are clearly under the direction of the FONHEP Executive Office, the composition and management of the Technical Teams – which mix and combine personnel and duties of both FONHEP and FSU – are not as straightforward. The Technical Teams – one for school administration, curriculum development, and research and evaluation – consist of FONHEP technicians, reporting to one of the three sectors, and FSU specialists from its Technical Service Centre, who provide leadership and technical assistance in school support activities and research. Consequently, the pressures on the Technical Teams arise from three different directions: from the FONHEP Executive Office responsible for school support from (i) Sectoral Services responsible for institutional development, and (ii) FSU responsible for research and evaluation. The potential for conflict is great, but overall has been avoided by close communication between FONHEP and FSU directors and mutual commitment to project goals.

The task specialization represented by this organizational structure has affected the types of information technology applications required and used by the Sectoral Services and the Technical Teams, respectively.

On one hand, the Sectoral Services, which handles external relations, recruiting members, etc., employs an entrepreneurial style, relying more on human-mediated communication, informal relations, and a relatively low level of information technology applications, such as word processing and budget spreadsheets. On the other hand, the Technical Teams deal with administration of performance contracts, materials procurement, and data collection and analysis. Not surprisingly, the Teams display a much higher level of documented communication, formalized rules and structures, and information technology applications. And among the Technical Teams, specified duties and tasks further differentiate their informational and management needs. Each has a distinctive approach to information technology applications. Likewise, the same would apply to the administrative assistant to the executive director and to project accounting.

The actual level of information technology applications use, however, does not necessarily correspond with the level of success of the applications. In fact, the opposite is the dominant pattern. Where the Technical Teams have attempted more sophisticated or extensive information technology applications, the development process has been difficult and the results have on occasion been less than fully successful. Where information technology applications were similar to the single-user, simplified word processing approach used by the Sectoral Services, they worked well. But where the desired applications were interdependent, multi-user, and higher in complexity, they often fared poorly. This pattern appears to be linked directly to the structure and norms of the organization, which themselves derive from the way in which the organization developed.

The project began with an ambitious timetable for development, which was dependent ultimately on the ability to forge a working coalition among the disparate schools, sectors, contractor, and donor. Developing a base of mutual co-operation and trust became the top priority. This was accomplished by placing project ownership in the hands of the sectors, conveying policy-making responsibility to the administrative council, and conducting decision-making by consensus rather than by mandate. This spirit of co-operation was reflected in the personal skills and style of the FSU and AID project managers, and in the basic philosophy of the organization as it grew. Its norms include low formality and an entrepreneurial, fluid, and autonomous style of operation, favouring accommodation and compromise necessary to a largely voluntary, representative organization.

Even though the basic role of the Technical Teams would appear to require a much more formal, centralized, and stable approach, the influence of the main organizational dynamics was very strong. Consequently, most of the problems concerning applications, described below. relate to the quality of the match between the operative norms and structure of the project and what would appear to be most efficient means of accomplishing short-term project tasks.

Sectoral services applications

The only major use of information technology in the development of the Sectoral Services was the telephone and word processor. The introduction of word processing technology was, in fact, quite successful there. The secretarial staff of the executive director and related sectoral personnel (approximately 5-8 per sector) either came with or quickly acquired basic PC-level word processing skills. There was an early standardization on types of personal computers and word processing software, largely because of the contractor's role in procuring equipment. So the preparation of good quality written materials (correspondence, reports, etc.) and electronic sharing of files (via disk exchanges) became routine and professional. As a result of this successful aspect of application development, the layout, appearance, and general style of secretarial and clerical work in those parts of the Project Offices have the general appearance of offices in much more developed settings. Staff are comfortable with these applications. Whereas at the outset of the project, computer stations were often unoccupied, today demand for computers has escalated to the point that each sectoral secretary is equipped with her own computer.

This success illustrates what happens when the organizational structure and operational norms, the choice of technology, and the capacity of the human resources fit well together. The tasks of the Sectoral Services Centre were not dependent upon sophisticated or extensive information technology for success, but rather on the diplomatic and human relations skills of project management and others. This part of the organization was not highly formal or interdependent. Word processing requires no careful co-ordination, collaboration, or formalization to work successfully. Each work station can function quite independently and serve the needs of the immediate user. Even standardization on software is unnecessary, since little exchange actually took place and file conversion is relatively easy. Moreover, the operation of the word processors was relatively easily learned and accorded sufficient status to make the task attractive to the staff.

It should be noted, however, that the efficiency gains due to mastery of the word processing process by clerical staff are offset to some degree by the reluctance of sector managers to use the word processing technology directly. To a person, each sector manager labouriously writes his memos, etc. longhand and then passes them to a secretary for transcription. Although this has been documented as a problem in more developed settings (Economist, 24-30 August 1991), the cultural dynamics extant in the project context contribute to the unwillingness of higher level staff to master these skills.

Project accounting

The project accounting operation is responsible for handling receipts and disbursements of funds and for recording and reporting these financial transactions. This includes the revenue that comes in from USAID and other donor sources, and the disbursements to employees, vendors, contractors, and other project participants. The project accounting operation has two main purposes: keeping track of financial flows for decision-making and control within the project, and accounting for the use of funds according to the requirements of donors, primarily USAID. The project has an annual budget in excess of US$.4 million, with thousands of transactions, so this is a significant operation. It also entails a significant amount of information, much of which is critical to the successful operation of the project.

The school support role of the project necessitates decisions about large flows of funds. The initial organization and operation of the project accounting operation reflected the legal and operational need to get up and running quickly and deal with the legal requirements of the initial contract with USAID. The arrangements for doing so were not necessarily the best ones for the longer-term needs of the organization. At first, the operation of project accounting was separate from the other elements of the project, and had a limited role in management, co-ordination, or decision making.

Success beyond this limited role was not feasible, however, because of conflicts built into the project structure and development plan. To function adequately the project accounting operation had to be responsive to separate, often conflicting demands from the sponsor (USAID), the contractor (FSU), and the project management (Executive Director, FSU Manager and PAC). Even in a stable, clearly defined organizational situation, such a complex task would probably have been beyond the capacity of the technology and staff expertise on hand. In an ambiguous and changing situation, it was most unlikely.

One technical problem was the mismatch between the amount of information to be handled and the technology employed. The office uses largely manual processing of accounting information. Some spreadsheet software on personal computers is used for part of the operation, largely for creating summary reports. But the several spreadsheets employed are not integrated or interactive. As a result, it has been necessary to report and summarize accounting transactions almost exclusively by hand. Therefore the accounting system could not quickly respond to different needs for information as it did not have the capacity to rapidly disaggregate and reaggregate the cost data. Although a fully computerized accounting system had been developed by a consultant in consultation with the accounting staff and project management, it never was integrated into routine accounting operations. First, there were some technical problems with the software that undermined its reliability and the staff only partly mastered its operation.

But, more importantly, it reflected a basic conflict built into the organizational structure for supervising and directing the project accounting office. In the early stages of the project, the FSU financial auditor largely supervised the accounting office. He issued strict instructions on how to amass and process the accounting information in order to respond to FSU and USAID vouchering systems. However, as project operations grew, project managers attempted to routinize and rationalize the policy- and decision-making process using financial information as a base. This strained the accounting system beyond its limits and illustrated its shortcomings as a management information tool. Vouchering and billing operations came into conflict with budgeting and planning activities. The accounting office displayed both reluctance and inability to adapt to both a computerized and more flexible system of tracking project expenditures to respond to all the needs of the project.

The problems with the accounting system illustrate how the process of institutional development and devolution of responsibility to local staff conflict with the need for contractor accountability. Project managers were eager to train local staff in the intricacies of financial management and to link financial considerations with programmatic ones as part of the institution-building process. The financial auditor, mindful of his responsibility to his institution, saw the accounting office mainly as a vouchering mechanism. If all these participants had the same approach, such an arrangement might have worked smoothly, but they did not. As a result, the project accounting office was not ready to take on full responsibility for accounting upon the transfer of primary financial responsibility to FONHEP in 1989.

This lack of readiness was illuminated by an audit of the project by USAID. The shift from contract (FSU) to grant (FONHEP) funding required a pre-award audit by the donor, USAID. The audit produced many complaints about the accounting system, most of which involved inadequate information in the different formats desired and resulted in incomplete expenditure justification. These were primarily problems resulting from the inflexible design of the accounting system itself and the lack of linkage between the project accounting office and the programmatic decisions and actions which create the expenditures. Considerable new information and changes in procedures were required by USAID before the grant was eventually approved. Consequently, a major stage in the project's development was jeopardized by problems in the accounting system which were direct consequences of basic organizational design.

Personnel administration and office management

Personnel administrative functions and office management for the project are the responsibility of the Administrative Assistant to the Executive Director. These include maintaining personnel and pay-roll records, purchasing and inventory of office supplies and equipment, and employee evaluation. (The employees involved are those who work directly for the project, not employees of the participating schools). The Administrative Assistant shares a secretary with the accounting Office but has no other staff.

Simple information technology applications play a large role in these operations. The Administrative Assistant uses personal computer spreadsheets for her salary and benefits records, office inventory, and expenditure records and justifications. These spreadsheets are used for regular reporting to the Executive Director and FSU. Both the secretary and Administrative Assistant use these applications, which appear to be straightforward, effective, and well received.

Information for employee evaluation comes from supervisors and co-workers. Ordinary paper files are used to store and retrieve this information. It is used by committees to review employee performance and make salary and promotion recommendations and decisions.

The existence of these specialized applications as part of the Administrative Assistant's responsibilities is a consequence of the Organization's separated, non-integrated information processing operations. Ideally, routine pay-roll reports could come from a pay-roll system integrated with accounting (as is found in many organizations). accounting for office supplies could be done the same way. In the project's system, by contrast, the staff person (the Administrative Assistant) collects the raw information on pay-roll, etc., and creates her own separate application. In an organization of this size, such an operation is both feasible and probably reasonably efficient, but it does not represent optimum use of the technologies available to the project. Nonetheless, the current system represents significant progress in the project's application of information technologies; originally these function were integrated into the accounting Office, but problems with its operation (detailed above) necessitated an alternative approach.

School accounting

Information processing is an essential task in achieving the project goal of school support. The project developed an organizational scheme for deciding what supplies and equipment each school would receive (described below). The implementation of that scheme depended on the availability and processing of three kinds of information for decision making: (1) what the schools wish to obtain; (2) what is available at what cost; and, (3) how much money is available to spend. A 'School Accounting' system was developed by the school administration team to track the budget allotments to the individual schools and expenditures from those allotments. In this way the school administration team knows the amount each school has to spend on supplies, equipment, and other resources at any particular time. This information, in turn, forms the foundation of the school ordering process, discussed below.

Early in the project, the school administration team established a simple – but limited – accounting system to track each participating school's receipt of materials and funds. Each school receives an annual allotment per pupil to use in ordering materials and support services. Unexpended funds from previous years carry forward in each school's account. The school administration team is responsible for calculating each school's account balance and ensuring that the school has not exceeded its budget limit. The team uses personal computer spreadsheet software to keep the accounts. Initially the spreadsheets contained only summary information by school, rather than complete records of transactions. The design of the spreadsheets did not provide for easy updating, nor did they provide for easily linking individual expenditures to school account balances or basic categories of expense. For several years, the school accounting system did not include clear, formalized procedures for routinely checking proposed expenditures against account balances.

Maintaining the accounts ran into some common organizational problems. One was lack of resources: the volume of transactions was too large for the school administration team members to process in a timely manner. Project secretaries resisted learning to use and update the spreadsheets. Therefore the accounts were seldom current and, thus, not useful as aids for the day-to-day decision making required in order to respond to school requests. As a result the decisions on ad hoc requests from schools were made by informal consultation with the sectoral services on the basis of need without reference to formal budget analysis and control. Even though there was a fledgling information technology application which could have provided the appropriate information, it was not developed or supported to reach that point. Instead, the informality of the organization remained the controlling ones.

Maintaining tight accounting control of school expenditures also appears to involve some role conflict for the school administration team. It tends to see its main role as one of support and assistance to the schools, rather than as an agent of control. The team (most of its members reporting to the sectors) values its discretion to respond to particularly 'needy' schools, rather than being bound by a strict accounting system and tight budget constraints. This is an area where some further task specialization would help, giving the budget control role to persons not as involved in or responsible for support.

As the size and complexity of the project grew, however, the staff recognized a need to institute more formal controls. With the help of a consultant, they began developing a purchase order approval system, as well as procedures for more detailed recording of transactions. While useful, this effort has been hampered by the structural separation between school accounting and project accounting, reflecting their different goals of accountability/vouchering and project management/implementation. One system could potentially track and analyze all transactions involving school material ordering, purchasing, and distribution. But without closer co-operation and integration between the two accounting operations, this is not likely to occur.

School materials ordering

- The ordering process and information technology selection

School directors prepare their orders at annual training workshops run by the school administration team. (Other training activities may be held during these workshops as well). All school directors are expected to attend these workshops, held in the spring/summer of the year. The team prepares for the workshops by computing the total budget entitlement for each school's purchases (ranging from US$.5-20 pupil/year), and by creating order forms for each school listing all the available goods and prices (usually over 200 items). The individual school directors assess what supplies and equipment they will need to purchase for the coming school year. At the workshop, the team instructs the directors on the guidelines and constraints, and how to fill in the order forms. Following the workshops, it collects the forms, reviews them, and translates the information on the order forms into purchase orders for the various vendors. As originally done, almost all the information was processed by hand.

As the project grew toward its design size of 300 schools, the job of processing all the order information by hand became unmanageable for existing staff. To handle the task, the team had to draw on other project staff for assistance, who were busy with their own activities. Processing the large volume of individual items and orders took so long that the delivery of supplies was delayed, leaving schools underequipped for the start of the new school year in October. The prolonged ordering process also interfered with the school administration team's other responsibilities. Some change was required.

The change could have taken place in a number of different ways. The process could have been spread over a longer time period, to allow the existing staff to handle the work flow. The amount of information to be handled could have been reduced by restricting the number of different kinds of items which the schools were allowed to purchase. The vendors or schools themselves could have been involved more directly in processing the order information instead of the full responsibility falling on the project staff. Each of these approaches, however, would have required some substantial adjustments in the rest of the organization's structure, standard operation procedures, or assumptions about the participants and environment.

The change decided upon by the staff instead was one that appeared to require only a very small adjustment in the existing organizational structure. By computerizing the ordering system, the lengthy ordering preparation process could be shortened and streamlined. This application was seen simply as technical enhancement to the existing organizational system, rather than as a new organizational system in its own right. The schedule and operation of the workshops were not modified, nor were the arrangements for choosing the menu of items, or basic communication between the schools and the project. The computer application was conceived as a direct, mechanistic substitute of electronic-for-human information processing.

This illustrates again how a particularistic approach to an information system application can affect its design. The main effect here is that the initial design decisions appear to have been made within a very narrow frame of reference, unmindful of a number of organizational and environmental constraints and influences which would later seriously interfere with the success of the implementation. The nature of the application developed also illustrates the way such an information system activity is bound by organizational constraints, such as:

Lack of technical expertise: When they decided to computerize orders, the project staff lacked knowledge or experience in data base application development. Although they did have a clear idea what they wanted the application to do, they did not have a detailed understanding of what technical means were required to achieve the desired result. To acquire the necessary expertise, they hired a consultant to design and programme the application. While skilled in the lower technical levels of programming, the consultant was not experienced in systems analysis or in fitting the application to the organization. The project staff, lacking experience in application development, viewed the task as strictly programming, rather than analyzing how the overall system would work. Thus the staff did not understand the consultant's shortcomings in this regard, and mistakenly turned the design of the application over to the consultant. The staff's lack of technical expertise in planning and supervising application development converged with the consultant's lack of systems and organizational expertise. This convergence had substantial consequences for the overall application and organization, as described below.

Organizational structure: The organizational structure constrained the staff's ability to reduce the amount of information to be processed, by reducing the variety of resources available to the schools. The goal of the project, as well as its governance structure, is to be responsive to its clients' (i.e. schools') needs. As the nature and problems of the individual schools vary widely, so do their needs. Consequently, a wide selection of resources and materials remained available to the schools. The size of the list directly affects the size and complexity of the ordering process: the more variety allowed, the greater the complexity. Thus the organizational arrangements had to be adjusted to the desired level of complexity and uncertainty, rather than vice versa.

The structure also constrained the school administration team's ability to mobilize resources from elsewhere in the project to assist in the larger order processing job. By itself, the team lacked the authority to conscript personnel from elsewhere in the organization. Therefore the administrative services team was limited to attempts to accomplish a larger task without significant increases in staff resources.

Time limits: The entire process of deciding on orders, collating them, communicating them to vendors, and delivering of the goods must take place in a limited time period (May-September). The ordering workshops take place as late as possible in the Spring, to reduce the uncertainty about the overall number of participating schools and their enrolments for the year to come. To allow sufficient time for processing the orders by the project accounting office, transmission to the vendors, and ultimate delivery to the schools, the team – with help from others on the staff – must collect, verify, and collate the orders in a matter of two to three weeks. The staff did not have the option of spreading the workload over a longer time, so opted instead for faster processing by computerizing part or all of the process.

Logistics, travel, communications: Some of the logistical problems arise from the difficult travel and communications situation. The participating schools are almost all in rural Haiti, spread over a large area, with many located far from the project offices in Port-au-Prince. Travel by road is often tortuous, phone communication often difficult or impossible, and mail is slow and unreliable. Further, school directors often lack the ability needed to adequately analyze their needs and communicate them in the necessary format. As there may be considerable turnover in the director ranks from year-to-year, some training is also necessary to ensure they understand the ordering policies and procedures. It is therefore not feasible to send order information back and forth in several iterations between the project offices and the participating schools.

Instead, to place orders, the directors attend a 2-3 day training workshop in Port-au-Prince in the Spring. With staff assistance, they determine their needs and complete order forms at that time, leaving them with the project staff. The staff then checks the orders for errors, omissions, and compliance with budget limits, and then collates the order information by vendor.

The staff discussed a number of alternative techniques to reduce the volume or speed the order processing work, but all were eventually rejected. These included having the school directors enter the order information on computers directly, employing mark-sensing or other optical scanning devices to 'read' the orders from forms, or ways of having the order information compiled in the schools or by the vendors. Some alternatives were judged unfeasible because the technology was not available or could not be supported locally. Others options, such as having the vendors process orders directly from schools, could not insure the accuracy or legitimacy of the order information due to lack of accounting controls. The staff believed that they had to retain direct control over the order information, both physically and organizationally within the project.

- Technology constraints and problems

The design and development of the order system application highlight both its constraints and general problems. The main design elements of the application consist of (1) the application programme environment (software and hardware), (2) the data and file structures (3) specification of desired outputs and processes, and (4) the organizational environment (rules, procedures, controls, support, resources, etc.) within which the application will be used. The design decisions for each of these major elements led to most of the problems encountered in implementation.

The development environment chosen included already available IBM personal computers (XT type) and the dBASE III data base software for these machines. These were choices of convenience and budget, rather than the result of a broad analysis of what the finished application would require. It was assumed that the available machines would be sufficient for whatever application emerged. The dBASE software was recommended by and familiar to the consultant hired to computerize the order system. Given the relatively low cost and ready availability of IBM XT-type computers and the wide use of dBASE software in similar applications, these were plausible choices – especially in the developing country context where local support and expertise is not always readily available. Unfortunately, these decisions did not take into account the possible need for additional machines for data entry, which became a serious constraint to system efficiency. Nor did they take into account the relatively slow speed of both hardware and software, or that more advanced data base software allows for more rapid development and easier maintenance and documentation of the application once in place.

The data and file structures chosen by the programming consultant were basically inappropriate for the tasks to be performed. They led to an unnecessarily large amount of programming and a cumbersome, internal arrangement of data. The consultant's inexperience, combined with lack of experienced supervision, led to a large amount of time and money devoted to the basic programming task before the overall application was functional in even a rudimentary fashion.

The tasks to be performed and outputs desired from the application were very narrowly and clearly defined. The system accepted information about the school, the items, and the directors' choices. The system could combine and print the orders by school or by vendor (for purchase orders), and produce cost totals to check against the actual budget entitlement for each school. These are routine tasks for any data base application and presented no serious technical problems. However, the application was not designed to fully exploit the capacity of the software to produce other kinds of reports, or integrate either input or output with project management or school support information flows.

The organizational environment for the application was virtually ignored in its original design. There was little initial attention paid to issues of how the input and reporting process would be organized, where the resources would come from, or how the application would integrate with the related process of ordering and supporting the schools. The application development task was clearly seen as an isolated one of software development, rather than one of more extensive organizational change.

- Implementation and revision

The problems with implementation emerged when the early versions of the application were ready for testing. The consultant and staff went through several iterations of testing, discovering problems, aborting the test, revising the programme, and retesting. No one remembered exactly how many of these iterations occurred, but it was clearly more than the staff was prepared to tolerate. The deadline for processing the orders was approaching and progress on the application appeared to be stalled. The project management (a co-author) responded by engaging a second consultant (a co-author) to review the software and make suggestions.

Two major problems were identified and remedies recommended, but a third problem was missed. The most obvious problem was the inappropriate data and file structure and that suggested modifications resulted in a smaller, simpler application design and required less programming. The changes could also be made without extending the overall schedule for completion. The second problem was that the choice of environment, both software and hardware, seemed too slow and limited. This was a more difficult matter, since a significant investment in the application had already been made. To change software environments would have meant losing much of what had been done, extending the overall time for development, and possibly adding significantly to the short-term costs. The longer-term costs may have been reduced by a faster, more easily maintained system, but those estimates were speculative. Also, a more advanced software system would have been more difficult to maintain and support in the Haitian context, since there did not appear to be locally available expertise in other systems. The recommendations also included acquiring additional hardware for the order processing. The project staff concurred with the recommendation but could not act on it in time for the equipment to be available when needed.

The third problem was largely ignored. That was the lack of adequate understanding of and planning for changes in the organization necessitated by the addition of the computer application. Clear responsibility for this aspect of the work was not assigned to any of the main actors: school administration team, project manager or consultants. As a result, basic logistical considerations such as staff training, supervision, adequate space, supplies, security for the equipment, etc., were not reviewed as part of the overall application plan. This is another example of lack of appreciation of the interdependence among these information processing components.

As might be expected, these oversights led to a number of largely avoidable problems. These difficulties were serious enough to have the staff abort the use of the system and revert to manual methods. The main problems were:

Staff resistance: Immediately following the workshops, secretaries were seconded from other work for intensive data entry tasks. They were untrained and unprepared for this work, which they viewed as onerous and beneath their status. In addition, the schedule for data entry was based on an assumption of a work pace substantially greater than the norm for the data entry staff involved. They complained, stalled, and produced at a very low level. The programming consultant was assigned to supervise this task, though she had no training or experience in management, and could not cope adequately with the negative reactions. As a result, the data entry work was performed much more slowly than expected, and created much friction among staff members.

Inadequate equipment: Only the slowest computers were available for data entry, and the application ran slowly. The data entry clerks spent a substantial proportion of their time waiting for the system to process entries. This increased their distaste for the work as well as slowed the pace.

Inadequate facilities: The lack of separate space for order processing caused two difficulties: (1) interference with and from other work activities and (2) insufficient security and supervision of the equipment. As a result, staff errors damaged part of the application software, further delaying production. Another staff member mistakenly turned off one system in the middle of a report, ruining that output and further damaging data. Lack of backup routines resulted in other data being lost, requiring re-entry.

These problems crippled the operation and resulted in a failure of the overall application. They would have been anticipated by staff with more experience of computerized systems and with a clear understanding of the interdependence among parts of the operation. As it was, project management and staff assumed that information technology was merely an additive tool to improve productivity and efficiency.

Evaluation activities

- The evaluation process and information technology needs

Evaluation of specific activities and programmes is a routine part of project activities, and essential to its goal of identifying the most effective interventions to improve educational quality in private sector primary schools. The resulting data are used for some ongoing management decision making, as well as feeding into files for project's summative evaluation design. Tests are given to teachers and students regularly. Monitors call on schools and review administrative practices. Data on school resources, facilities, expenditures, etc., are routinely reported and processed. The evaluation services team is constantly either collecting, storing, or processing some new data. And most of the data eventually find their way into a computer file.

Of all the information processing activities in the project, the work in evaluation comes closest to what might typically be called an Educational Management Information System (EMIS). These are systematic, computer based procedures for obtaining and analyzing information about the performance of an educational programme or intervention. The information is often used directly in managerial decision making. The evaluation data system is not, however, the product of an overall *management design*. Nor is there an explicit, clear, and comprehensive linkage between evaluation results and the day-to-day management of the project. Rather, the activities are the product of an overall evaluation design, built into the project from its beginning by the project designers and elaborated by project management. Because the evaluation system and the management systems were not designed together to form one cohesive system, the two systems reflect different goals, which leads to difficulties in what might otherwise be a good fit between evaluation and management.

In theory, there is an obvious convergence between the aims of management and of evaluation. Management acts to achieve the goals of the project; evaluation looks to see how well the goals have been met and inform improvements. But in practice, a number of constraints prevent this apparent integration from occurring. These are in many ways the same constraints and difficulties which prevent policy analysis and research from strongly affecting policy (see, for example, Lindblom, 1970; and Weiss, 1980).

The governance structure places the project in a dependent relationship viz, two major actors who have divergent interests. This virtually guarantees that there will be shifting, conflicting goals and demands for performance information. The two major sources of direction and influence are the project's implementors and stakeholders (the sectors, the administrative council, FONHEP and FSU) and the donor (USAID). In addition, there are other funding sources, the Haitian Government, and needs of individual schools to heed. This arrangement makes it very difficult for the project to maintain a stable set of goals and regular information flows. Instead, the staff must respond to frequently shifting and conflicting demands for performance evaluation information.

Another problem arises from the use of performance incentives. The methodology of the project is based on the premise that the schools and teachers will respond to incentives for improved performance. Testing this hypothesis requires, among other things, some control of the incentives, including some systematic variation in levels to test effects. However, these incentives have become very important to the schools and teachers. Therefore any changes, especially reductions, are cause for serious repercussions on the political level. If the project management responds to the pressure associated with its institutional development goal by changing the incentive design and evaluation criteria, the validity of the overall evaluation may be compromised.

The project design did not anticipate the growth in importance of information processing technology in evaluation and management. Consequently, there was no master plan or overall policy framework for its use and development. In the absence of policy or plan, the development of the technology in the various parts of the project was organic and haphazard. On the positive side, such growth allows many small applications to grow rapidly and successfully, with participation from the users. The parties to the development of the applications were not constrained by controls imposed from higher levels in the organization, and were otherwise committed, involved, and in control. On the negative side, however, without centralized co-ordination and control, there was little compatibility across applications, no structure built to support sharing information resources systematically, and no mechanisms put in place for co-ordination and control. In other words, the information technology development proceeded as though the various parts of the project were quite independent, whereas in fact a number of important information flows are rather interdependent.

Lack of projecting data processing needs as part of a plan has resulted in a hardware and data entry bottleneck as well. There is a shortage of clerical assistance and workstations necessary to keep up with the flow of data and related processing and analysis demands. Storage space and security provisions for data are in short supply as well. This is less a problem of scarce financial resources than lack of anticipation of needs and relative inability to articulate them:

Evolving evaluation design: Part of the responsibility of the evaluation services team, working with other project staff, has been to complete the specification of the evaluation design. It must, of course, follow the basic design of the project. But most of the details of variable definition, data collection methods, and analytical models have been developed during the course of the project. These details have changed frequently, due to many iterations of development, review, and revision. These changes have complicated the process of collecting and organizing the data into computer files, with resultant delays in the analysis and reporting of some results.

Escalating information expectations: The project staff has responded to information demands by implementing information technology applications. The technology has increased the capacity of the staff to collect and process information. Knowledge of this increased capacity has led managers and external agencies (USAID) to increase their information demand which has led to more technology, and so forth. This upward spiral of demands and capacity has diverted staff attention and resources from other project activities.

Part of the shift in expectations is expressed in demands for answers to new questions, ones which were not anticipated in the original data collection designs. For example, the staff did not originally record student's gender as part of reporting some achievement test results, since no gender breakouts were required. Later, USAID requested score summaries by gender, in relation to some newly raised sex equity concerns. The staff had to reprocess a large volume of test score data to produce these new analyses. The staff complained that this kind of work interfered with its ability to fulfil its other responsibilities.

- Application design and implementation

One level of evaluation applications involves a large number of small, highly specific, ad hoc information processing routines developed by the evaluation services team to handle particular evaluation data sets. For example, a set of routine achievement test results would be written first onto coding forms, keyed into a word processing programme to create separate data files, which are then read into a series of statistical procedures to analyze the results. Each set of test results, or other data, are handled separately, with new analysis routines and reports prepared when needed. Both the regular evaluation services team and evaluation consultants participate in creating these processing routines and products. This process has been operating since early in the project.

The second level, implemented in the fourth year of project life, is a single, integrated data entry system designed for input and storage of most quantitative evaluation data elements into a system of linked files. This system will eventually replace the individual applications for incoming evaluation data. It consists of linked data bases, input, editing, and reporting elements programmed in the same software environment. The data base structure provides separate files for various years and units of analysis. It also provides for merging and aggregating files where desired, including the individual applications used earlier.

The integrated system was understood from the onset as requiring continuing development and change. That requires local capacity to implement the changes. Therefore the basic design was created and implemented by a consultant working with the project staff and a local consultant retained for these purposes. The staff and local consultant were trained in the basic design and development techniques for the system and documentation was prepared. This allowed the project staff and local consultant to maintain and expand the system as needed.

- Using evaluation data: success and problems

Most of the information technology applications in evaluation can be described as successful. A large volume of student and teacher test results are routinely collected and analyzed. These analyses are used by the Curriculum Services team for decisions on curriculum development and teacher-training content. Teacher performance test results are also used by the project administration for allocating incentive payments to teachers (primes). Large volumes of school, teacher, and student performance data and analyses are available for interim project evaluations, as required for USAID. And the project is regarded as the prime source for data about private education in Haiti. It receives numerous requests for data from the government, donors, and other organizations. All of these point to a highly functional evaluation information processing operation.

The ready availability of large amounts of quantitative evaluation data raises issues about its proper role in decision making. One issue is whether to rely more on quantitative or qualitative data for decision making. The evaluation services and school administration teams devote considerable effort to producing a large stream of quantitative data and analyses as a basis for decisions. These include allocating teacher incentive payments, developing teacher-training programmes, design of curriculum materials, etc. The staff also collected qualitative data systematically. These include narrative descriptions and reactions to programmes, training activifies, classroom observations, etc.

But there is little consensus on how these should all be used. Some staff complain that decision-makers ignore some of their work, or use 'non-relevant' criteria for decisions. They attribute this in part to a lack of awareness by some decision-makers of the 'scientific methods' involved. Some report that others have biases for certain types of data, ignoring qualitative data because numbers are easier to interpret. Others, they say, "don't believe in tests, analyses, or samples", and that they substitute 'informal' criteria for programme decisions.

The Curriculum Services team appears to make the least use of the formal quantitative data flow, relying more on qualitative, informal exchanges with staff and participants, although it has devised instruments of its own to test the effectiveness of the materials it develops. Other staff exhibited some impatience towards the rigidity of quantitative methods and expressed preference for the professional judgement of the staff. Some also reported that the executive director accepts the quantitative analyses, but that Sectoral administrators tend to prefer the informal, qualitative information sources of their own. Further, staff hostility to the 'extra' work entailed by evaluation data collection and analysis, not considered essential to school support, is masked by criticism of methodology.

This particular issue appears to reflect two distinct factions, perhaps sub-cultures within the staff. This cleavage on methodological grounds may have several causes. The project's overall preference for quantitative data (given the project design and demands by USAID) may be seen as conferring power on those who use and control the sources. This may be challenged on methodological grounds by others on the staff who lack this resource and are seeking to redress a power imbalance. It may also be an ideological issue, not all that different from what is occasionally found in some university departments: some analysts simply believe that some forms of data or analysis are inherently better than others. In either case it affects the use and processing of information directly.

Some problems have resulted from inadequate resources to handle the large volumes of data. The large number of files and ad hoc processing routines from the first level of processing are difficult to access and integrate with other, later data. This will complicate longitudinal analyses. Moreover, there is no overall data handling plan to provide for these two separate repositories of data. There is, in addition, a large, continuous data flow into the project from ongoing monitoring, testing, observations, and routine administrative operations. This flow regularly threatens to swamp the staff. The Evaluation Services team is constrained in its ability to keep up by other workload and by lack of staff support, machine stations for data entry, and general storage and processing space.

The outflow of information from evaluation activity is problematic as well. There is a well understood policy that release of data or evaluation results outside the project must be approved by the Executive Director. This is understood to be a blanket prohibition, independent of the information or recipient involved. Project staff support this policy, recognizing this kind of control of information flow is in the project's interests. The results of incomplete or preliminary work could give a distorted and damaging view of the project. They also recognize that once released, such information could be deliberately distorted or misused to work against the project. These issues are serious ones within the politicized context of Haitian education.

Ironically, an additional problem presents itself in an over abundance of data, that cannot possibly be fully analyzed. Staff constantly must remind themselves of the central research questions of the project and tailor analysis to these parameters. Interesting details can inform their analysis on major questions, but by themselves often lead to dead-ends. Information overload is one of the seldom discussed aspects of information technology applications.

Discussion

One consistency that appears across these applications is the lack of appreciation for how highly interdependent certain information processes are in the organization. This results in unpleasant surprises caused by the interactions among the sub-units and interests in the organization. Because the applications grew in response to localized needs, their interdependence with other parts and processes of the project was not considered. Attempts to put the applications into full operation, however, revealed these interdependencies. The secretaries rebelled; there was not enough space; the users didn't know how to use the software; there was not enough help; the computers were too slow; people kept changing their information needs, etc. These were more than occasional oversights, which can be expected in even the best planned operation. This has the appearance of a pattern of tunnel vision.

The pattern fits Stinchcombe's (1990) discussion of the distinction between an invention and an innovation. An invention in this sense is any new technique or device to perform some organizational task, such as a new accounting spreadsheet, or an order processing programme. Getting the invention to work in the organization requires *innovation*, that is, the development, testing and implementation of all the changes, adjustments, etc., necessary to get the invention to work in practice. Many inventions fail to become innovations, in Stinchcombe's view, because the approach to implementing them is based on a *technological utopian* theory. That is, a simplistic and unrealistic understanding of all that is necessary to get the invention to work.

Problems with the project accounting system, school ordering, and some of the evaluation procedures certainly stem in part from such a source. The tunnel vision concentrated attention on the details of the computer applications, instead of the interdependence of the information processing activities with other parts of the project. These utopian and technicist approaches prevailed in large part because of the stress and pressure of implementing a highly complex project in a short time in a turbulent environment. Consequently, relationships between the information process and project structure were not kept in sharp focus.

The information technology itself has also affected some of the interactions between the organization and its environment (USAID, sectors, schools). Information exchange has been a·key element in those relationships. Using technology to *automate* certain processes served also to *informate* that part of the organization as well (Zuboff, 1985). That is, when interested parties found out that the automation was in place, they understood that more information was available and demanded it. This led to the spiral of increasing information technology leading to more information demands, leading to more technology, and so forth, without adequate, comprehensive planning.

The fragmented, unsophisticated views of information technology that underlie utopian theories and tunnel vision are hardly unique to this project or to developing countries. Documentation of similar problems in the USA and elsewhere is widely available (see reviews in Zuboff, 1985 and Scott, 1990). In fact, many of the project staff are well trained and have access to the same literature and equipment as their USA consultants. The problem is more one of perspectives. The models and theories (by and large) and the training in information technology don't include the organizational perspective. And organizational theory is only recently giving major attention to information technology per se. One clear lesson here is that concerted effort is necessary to understand the full range of interdependence.

The growth of the project has been another source of difficulty. Though the growth was planned, there has been a penalty, of sorts, for success. The information technology applications were not generally designed with the current operation of the project in mind. There was no overall provision for parallel growth of applications, so they developed in a largely *ad hoc* manner. Many began when the project was smaller, less formal, and the applications reflected that scale of operation, often with manual processing of information. As the project grew, therefore, the applications became less effective, or more difficult to sustain. The growth of the project also involved shifts in the amount and type of information demanded, as a result of changes in evaluation designs and lessons learned. As the project got generally bigger, therefore, it got predictably more complex and required more formalization.

The availability of computer-based information technology, and its attractive promises of efficiencies, looked like the best way to cope with the increased demands of scale and reporting requirements. The strategy employed, however, was to do more of the same, rather than re-examine the needs of the larger, changed organization. For example, none of the information applications in place is specifically designed to support project management. When the project was growing, the main information needs of project management were related to the political and organizational dynamics of institution building and external relations. Computers were of little immediate use except for word processing. The information applications in place were designed for lower-level management functions.

Within the last two years, enormous changes have taken place within the project as the managing institution gains experience and maturity. The establishment of FONHEP has moved the project from a short-term donor assistance activity to what promises to be a permanent indigenous educational development effort. The result is that long-term goals have been defined and institutional structure is relatively fixed. As never before, project management is currently more concerned with rationalizing and improving efficiency through management systems. As evaluation data has emerged in more reliable and accessible form, it has gained credibility in informing policy and management.

This organizational context and task environment are more suited for MIS applications. With improved planning and perspective, information technology applications can make an even more effective contribution to efficiency and continued growth. But the applications in place are poorly suited to that use. Redesign and integration are the current needs. Had the effects of scale been built into the original plan, the availability of useful information for project management would be much higher. But was this possible?

The preceding analysis unquestionably derives from 20-20 hindsight by the very people who participated in the development process. Some problems that did arise were in some cases anticipated, but unavoided because of other, more compelling considerations. Organizations cannot be exclusively tailored to conform to the most efficient means of information technology. Other problems came as a surprise and could have been avoided with experience. Clearly, awareness of the data processing and information needs at the outset of the project is a *sine qua non* of good planning in the context of today's information technologies. Yet analysis of the project experience and its current readiness to improve information systems shows that perhaps the problems associated with information technology applications are an inevitable function of institutional growing pains, and can be resolved as institutional identity coalesces and personnel attain the psychological readiness to accept both the technologies and the multiple dynamics and consequences their use implies.

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Part IV
Conclusions

Chapter 10

Linking data to action

David W. Chapman
State University of New York at Albany

Lars O. Mählck
International Institute for Educational Planning,
France

Many developing countries are now making dramatic gains in improving the availability, relevance, and timeliness of data about their education system. The fear is that the victory may be hollow. Improving the information available to decision-makers has not always led to better decisions or better practice. Some critics argue that, if anything, debate about information needs, data flow, and data quality have diverted attention from issues more directly related to the quality and delivery of instruction. Where information systems have been implemented, the flood of new information often has served only to clog up the system, not streamline it. There is a growing concern that the promise of information systems will not be realized unless more thought is given to ways of improving information flows connected to better practice, particularly practice at the school-level, where the real activities of education occur. The 'Issue Papers' and 'Country Studies' in this volume represent one effort to address this linkage. This chapter offers a set of general observations based on the preceding chapters. The intention is not to summarize but to extend the discussion. Then a set of issues that need to be addressed if countries are to continue strengthening the quality and impact of their information systems, are identified and formulated as a research agenda. Finally, the skills and knowledge needed by staff working with an information system are formulated as a training agenda. These agendas are proposed as frameworks that officials within each country can use to evaluate the needs of their own system.

Observations on information use

1. *Some of the more widely held assumptions about how improving information operates to improve educational quality and efficiency need to be reexamined.* Some widely advocated strategies do not appear to generalize well. In other cases, it seems like limited

experience has been transformed into a conventional wisdom that oversimplifies the dynamics of educational change. For example, the experience in Chile, described by Schiefelbein (*Chapter 6*), challenges the notion that knowledge of school performance relative to other schools will necessarily motivate teachers to change their practices. Windham (*Chapter 2*) questions the belief that decentralization of data and decision making will lead to more locally responsive decisions. It may only shift the problems to a level where staff are even less prepared to deal with them. Computerizing a project, as described by Cresswell et al. (*Chapter 9*), may yield advantages, yet may have unanticipated side effects and spark unforeseen resistance that offset the gains in timeliness and accuracy of information. These authors are not arguing against the need for better information in decision making, but against easy assumptions about how those data will be used to affect policy, planning, and practice. In some cases, popular assumptions are grounded in a logic which is not borne out in practice. In other cases, what appears to work on a limited scale does not hold up when the effort is implemented on a national scale. In yet other cases, the arguments were built on wishful thinking, presuming things about peoples' interest and motivation that are not necessarily true.

2. *Lack of impact (of information on decision making) is often due to the failure of decision-makers to understand the organizational context in which educational improvement efforts take place.* Education systems in nearly all Third World countries operate as steep hierarchies. Steep hierarchies are based on the assumption that 'thinking' will be done at the *top* of the organization, 'doing' at the *bottom*. Middle-level staff are expediters. Their role is to summarize information for top management and to instruct, monitor, and control sub-ordinates (Savage, 1990). These steep hierarchies are organized through clearly articulated, but narrowly defined, departmental charters and job definitions which define who is responsible for each task. This represents an attempt to establish clearly defined spheres of authority and responsibility in order to maintain accountability, but the specificity has an unintended impact. Accountability is gained at the cost of lateral integration. Decisions get made from the narrow confines of one function, without an understanding of the larger context. This pattern is further complicated by the tendency toward risk avoidance within organizations, a dynamic rooted in the organizational incentive structure and reflected in the nature of hierarchical relationships (Hannaway, 1989; Crowson ; Van Cleve, 1991).

In theory, the increased availability of information within a system is supposed to make it easier for those at each level to evaluate the potential consequences of their actions on the larger organization. In practice, efforts are made to contain the increased information within the existing channels of communication and authority. More information does not necessarily improve the connection among units, it may only give them new turf to contest.

3. Much of the thinking about data systems is grounded in an assumption that better data leads to better plans and policies, which lead to better practice. The loose connection between plans and policies, on one hand, and practice, on the other, has too often been overlooked. *In translating data about the status and trends of an education system into meaningful practice, more attention needs to be given to understanding the incentives for change.*

Change occurs most rapidly when people want to change; when they see some benefit in doing so. Therein is the problem. Many Third World teachers are not unhappy with their classroom practice or with the accomplishments of their students. Their students learn, leave knowing more than when they began, and go on the next grade. Because they know their students well, they take pride in the subtler aspects of students' growth and development as well as their academic performance. Teachers have substantial pride in what they are doing and how they are doing it. This is not to say they don't believe they can improve, only that their present level of performance is satisfactory in helping them gain the ends they seek.

New reform programmes demand they try new teaching behaviours, use different instructional materials, employ different testing procedures, or subject themselves to different types of instructional supervision, all in response to a problem that teachers may not see as existing. When a new reform programme comes along, teachers may fully understand what is expected of them and seek to do those things. But they may not share a commitment to change their own or their students' level of output. For example, if by using a new curriculum their students reach a level of proficiency two weeks earlier than usual, many teachers see it as an opportunity to relax rather than as an opportunity to cover more content. From the teachers' perspective, this may be quite a reasonable judgement. Covering more content encroaches on that covered by teachers in the next grade who, in turn, have to start their coverage at a different level and end up encroaching on teachers in yet the next grade. System planners and administrators may see this as increased quality and efficiency, exactly the ends they seek. Teachers often see it as an unwelcome intrusion that upsets routine, threatens peer relationships, violates expectations, and complicates their worklife.

Teachers operate within a complex network of expectations, incentives and rewards (Hallak, 1990; see also, Lewy, 1991). If better information is to impact on school practice, policy-makers need to incorporate informations about how teachers view their worklives, and the motivations and incentives to which they respond. While Kemmerer (*Chapter 3*) and Bude (*Chapter 4*) address these issues most directly, they are well illustrated in the Chile and Togo country studies (*Chapters 6 and 7*).

4. *Management information systems may enhance formal communication flow at the expense of important informal patterns of communication.* Informal communications networks are an important element in both organizational stability and change. These hidden networks of inter-relationships are undertaken to get necessary work done; people form coalitions and alliances that cut across traditional boundaries. These invisible networks are often the real strength of any system, yet most information systems are blind to their existence (Savage, 1990). The introduction of an information system, with its rules governing information flow, often violates (or wipes out) informal communications patterns. While improving the quality of information, it may destroy the most effective means of getting it used.

Computerization of information systems may lock organizations into particular relationships that are not functional. While it is championed for its ability to increase accuracy and timeliness of information, it often computerizes the contradictions, confusions, and inconsistencies in the existing operations of an organization (Savage, 1990). It may introduce a historically dated understanding of a problem or process. To the extent that computerization serves to petrify existing relationships, it can stifle creativity in responding to problems.

While Welsh (*Chapter 5*) addressed this most directly, it flavours both the Mauritius and Haiti country studies (*Chapters 8 and 9*).

5. *More attention needs to be given to understanding the interpretive context in which information is evaluated by potential users.* For example, one of the most powerful factors operating to shape and hold individuals' behaviour in a particular pattern is peer pressure, the judgements and values expressed by those around them. Before changing behaviour or expressing a new attitude, a person generally checks out their new idea with the circle of others they belong to (or want to belong to). These circles of people reinforce each other's beliefs and values, and influence each other's behaviour. These networks define the informal communication system. These networks hold expectations in place.

The networks that operate at different levels of an administrative hierarchy are different. They tend to be composed of the people at the same level of the system. At the top of a national education system the number of key players is small and they are all linked together in the same network. They talk to each other; they seek each other's opinions, advice, support, and approval. They test out new ideas on each other. Ideas poorly received by others in their network tend to be quickly modified or discarded. At the middle levels of the administrative hierarchy there are more people and it is harder to be tied into the same network. Given the problems of communication as numbers grow, cliques and sub-groups tend to be more important as the reference groups that mediate the acceptance of new ideas. Often these groups follow the organizational structure; people talk to those closest to them. Consequently, there are several networks, composed of sub-groups of officials whose bonds often are formed around their level in the hierarchy and the common issues they face at work. These multiple communication systems often operate reasonably independently and often in competition with each other. Information becomes currency, doled out to friends and withheld from others (Savage, 1990).

At the bottom of the hierarchy are the teachers. There are many of them and they tend to be isolated, in little or no formal communication with each other; they tend not to have networks, or to have networks defined by their physical location. In many cases, since schools are small and isolated, the strongest networks tend not to be school or professional, but the social network of the community parents of students, community leaders, friends, and family.

How does change occur? Networks operate both to maintain existing norms of communication and behaviour (the *status quo*) and as gatekeeper for new ideas. New ideas get tried out within one's network first. If accepted, they get shared with a wider circle. Change happens when people come to see things differently through their networks. Too often, however, this dynamic is overlooked as senior administrators believe that promulgating policy or sending directives leads teachers to change their patterns of practice. Bude (*Chapter 4*), Welsh (*Chapter 5*), and Windham (*Chapter 2*) all remind us of the importance of lateral and horizontal linkages in mediating change and challenge use to find ways to create and support the networks necessary to bring those about. The Chile and Mauritius case studies illustrate some of the key issues in forming and sustaining those networks (*Chapters 6 and 8*).

6. *Connectivity does not mean integration*. The successful implementation of an information system has consequences that may be problematic to senior officials. It may put professionals on a more even level, permit violation of channels of command in communicating with people, and allow staff to circumvent hierarchical information flow. Top officials may believe their authority will dissipate when sub-ordinates can communicate directly with their peers in other departments. An essential element of their position, power over

information flow, is diminished. There are practical consequences. When information about topics under debate is widely shared, decisions have to be justified on more objective grounds, crimping the prerogatives of some senior administrators. Welsh (*Chapter 5*) describes this well; the Mauritius case study (*Chapter 8*) helps illustrate it.

The message of the preceding chapters is that better data is a necessary input to effective decision making, but not a sufficient one. The positive impacts come only as the information is used, and used wisely. This requires that users have access to relevant and accurate data, the necessary training to interpret them, and an understanding of the larger context in which their decisions will be implemented. It requires, also, that users pay attention to the impacts of their decisions — how information contributes to policy, how policy influences practice, and the incentive systems that operate at the various levels of the organization. The remaining portion of this chapter suggests agendas for continued research and training aimed at strengthening data use.

A proposed research agenda

Research is broadly understood here to be systematic inquiry aimed at improving data quality and information use. For purposes of this discussion, it includes monitoring, evaluation, logical analysis, empirical investigations, and demonstration projects.

Five categories of research and evaluation are essential to the continued development of management information systems and to extending the use of national data in decision making: (1) research on the information system itself, which examines data quality, flow, and usability; (2) research to identify and develop indicators; (3) monitoring and evaluation of sector activities; (4) research and evaluation using the data contained in the information system to better understand the relationships among the inputs, processes, and outputs of the educational process; and, (5) research on the organizational factors so crucial in determining the manner and extent that information is communicated and used within the education sector. These five stages can be understood within a loose hierarchy, some elements being prerequisite to others, though frequently, activities at several stages may overlap or operate concurrently. These stages (and examples of activities that might appropriately occur at each stage) are summarized in *Figure 1* and discussed below.

Figure 1. Suggested research agenda

Stage I: Research on the MIS – Data quality, flow and relevance
1. Assessment of data quality
2. Assessment of data flow
3. Assessment of user attitudes
   (a) toward data quality
   (b) toward data flow

Stage II: Research to identify and develop indicators
1. First-order indicators
2. Second-order indicators

Stage III: Planning, monitoring and evaluation of sector activities
1. Reporting system status and emerging trends
2. Formulation of projections
3. Identification of policy implications, based on trends and projections
4. Monitoring level of programme implementation
5. Evaluating programme and project impacts
6. Evaluating impacts of policy
7. Unanticipated cross-impacts of policy

Stage IV: Research using data bases available through the MIS
1. Correlational studies of relationships between inputs, processes, and outputs of education
2. Correlational studies of relationships between inputs and outcomes of education.
3. Identification of policy implications, based on trends and projections

Stage V: Research on information utilization
1. Organizational studies of communication patterns within the education sector
2. Impediments to horizontal and vertical information flow
3. Organizational studies of communication patterns across sectors
4. The identification of policy options

Stage I: Research on data quality, flow, and relevance

One of the most commonly expressed sources of resistance to greater use of national education data in decision making is that users do not trust the data. While this is sometimes intended to mask their own inadequacies in understanding the data, it often represents a reasonable assessment of the situation within their country. Before encouraging educators to rely on data, it is necessary to demonstrate that the data are an accurate representation of the situation in the schools.

An early research agenda, then is to investigate the quality of the available data and issues in data flow that might threaten that quality.

There are four primary threats to data quality: (i) errors and omissions in reporting data; (ii) errors in transferring and summarizing data, (iii) errors in the treatment of missing data ; and, (iv) lack of consensus about data definitions (Chapman ; Boothroyd, 1988). Errors and omissions in reporting data occur in situations in which there are no incentives for school personnel to complete school surveys sent out by the ministry, and no sanctions for not completing the forms. This results in incomplete national data, with schools most in need of special consideration (e.g., rural, isolated) most likely to be the most underrepresented. Error is also introduced in situations in which the interaction of ministry policies leads to incentives for over- or under-reporting enrolments. For example, school enrolment data prior to the civil war in Liberia was used by the ministry to monitor the collection of student fees from each school (Chapman, 1991).

Headmasters quickly realized that they could supplement their school budget by collecting the fees but under-reporting the enrolment. In countries in which textbooks, teachers, and other resources are allocated to schools on the basis of enrolment, it creates an incentive for headmasters to exaggerate enrolments, hoping to secure more resources. There are three principal agenda for research at Stage I.

1.1. Assessment of data quality

A major impediment to more effective use of data is the concern of potential users about the quality of the data available to them (Chapman, 1990; Hallak, 1990; Imboden, 1980). Resistance to more systematic use of education data in planning and decision making is often grounded in users' scepticism as to whether the data are any more reliable or trustworthy than the more informal sources of information they have been using (Chapman, 1990). Consequently, a first priority in improving data use is to assure potential users that the data are reasonably accurate. A general design for this type of study is to audit the consistency in the data that are recorded for the same classroom (or school) at each level of the education system, from school, through district and regional education offices, to the central ministry.

This can be expensive, since it generally involves site-visits to a sample of schools, district offices and regional offices to review records. Recent studies in Yemen (Chapman ; Boothroyd, 1988) and Nepal (Chapman ; Dhungana, 1991) illustrate this approach.

1.2. Assessment of data flow

Studies of data quality need to be combined with a consideration of data flow, since problems in flow are often the source of the quality problems. Headmasters may not assign much importance to completing the form in an accurate or timely way or may not understand what data are being requested. For example, an item on the annual school form in Somalia asking for the number of desks in each classroom proved uninterpretable, since some desks seated one pupil while some seated two. Knowing the number of desks did not provide the intended information about how many pupils had a place to sit (Gaal and Burchfield, 1988).

Too often, however, ministry personnel attribute low data quality to recording and reporting problems in the schools. More careful study frequently suggests that problems in transmission across levels or units of the ministry account for many of the problems encountered (Chapman, 1991; Ross ; Mählck, 1990). Several countries have found that errors were introduced when data from the schools were summarized at district- or regional-levels, often by poorly trained staff working without the benefit of calculators or computers. A closely related problem occurs within the central ministry itself when several units of the same ministry collect the same types of data, leading to multiple sources of discrepant information (due to the timing of the data collections and differing definitions used). The discrepancies often fuel the controversy about data quality, undermine decision-makers' confidence in quantitative data, and force them to resort to other grounds to resolve differences of opinion. Studies of data flow are intended to identify these types of problems related to collection and transmission of data from the school to the ministry, and the flow of eventual summaries and results from the ministry back to the school.

1.3. User attitudes toward data quality

What potential users believe about the quality and availability of data often has more impact on their willingness to use it than the actual characteristics of the data themselves. It is not enough to investigate the characteristics of data and procedures for collecting it. It is also necessary to understand how potential users regard the information which is available to them. The constraint on data use posed by users' misperceptions cannot be underestimated. Recent research indicates that even ministry officials who claim to assign great importance to data as a basis for decision making are often unaware of the data already available to them and frequently misjudge the accuracy of those data (Chapman, 1991; Ross ; Mählck, 1990; Gaal ; Burchfield, 1988). An early research agenda should be an assessment of the attitudes and beliefs of key users regarding the types of data available to them, the accuracy and relevance of those data, and the sources of error they believe operate in those data. To the extent these perceptions are true, such studies help identify aspects of the information system that need attention. To the extent that independent analysis suggests the perceptions are not true, such studies identify needs for training and for better marketing of the data that are available.

Stage II: Research on indicators

For data to be useful to decision-makers, they need to be formulated as indicators. Indicators are measures of individual and system performance along dimensions judged important in planning and resource allocation. For example, test scores are commonly used as an indicator of academic achievement; school completion may serve as an indicator of the internal efficiency of the primary education system. The appropriateness of particular indicators is judged in terms of the fidelity to the underlying reality they represent (e.g., is the examination score a good measure of what students have learned?), the extent to which they are relevant and understandable to the data users, and the extent the data needed for these indicators can be collected in a cost-effective manner. First-order indicators are those on which data are collected directly, such as the number of students, teachers, and classrooms. These first-order indicators can be combined to form a series of second-order (or derived) indicators, such as student/teacher ratios, unit and cycle costs, and textbooks per student ratios. These second-order indicators need not be stored in the data base, but can be calculated as they are needed.

There are two primary means of specifying what data needs to be included in an information system and what indicators should be developed from those data. The first is to identify what information decision-makers say they need. The second is to follow a conceptual framework of the management decision process. In practice, the selection of data and indicators needs to be based on a process that combines these approaches – neither approach is sufficient by itself (Windham, 1990). Senior officials and programme managers often are unsure of what data they need. There may be information that would help decision-makers, but lacking experience with such information, they may not ask for it. Similarly, use of a conceptual framework of the education system may result in choices that are inappropriate or impractical within the special circumstances of a particular country.

A useful approach is to start with a conceptual framework of education indicators, then modify and extend it based on input from decision-makers about what information they need. This approach is best accomplished with a series of studies aimed at identifying the types of decisions potential data users expect to encounter and the types of information they need to address those decisions. A growing literature on educational indicators provides useful suggestions of indicators and the data needed to operationalize them (see Windham, 1992; Ross and Postlethwaite, 1992; Easton, et al., 1991).

Stage III: Planning, monitoring, and evaluation of sector activities

Perhaps the most direct operational application of information systems is to support ongoing planning, monitoring, and evaluation activities of the ministry. At a minimum, planning requires description of system status on the indicators selected in Stage II (e.g., number and location of schools, enrolment, staffing, and facilities available in those schools), determination of trends in these indicators over time, and the preparation of projections based on these trends. As plans are implemented, the concern at this stage shifts to ensuring that programmes and projects are being implemented on schedule and according to plan; that unanticipated problems are identified and resolved; and, that programmes are having appropriate levels and types of impact. The information system can be a major resource to those responsible for monitoring and evaluation.

Inspectors and supervisors constitute another, potentially important, source of information and agent for quality improvement. Formally, these intermediary level officials occupy a key position in the education system: they are supposed to provide advice and assistance to teachers and principals, assist in-service training of practitioners, monitor the implementation of the curriculum, deal with problems of attendance, drop-outs, school supplies and so on. The exercise of all these activities have been hampered by the economic austerity that prevails in many developing countries. The austerity has probably also contributed to undermining the inspectors' function as a relay or a transmitter of classroom and school quality information to regional and central levels. In fact, the units for planning, curriculum development, teachers training, etc. might greatly benefit from a better organised reporting system for inspectors and supervisors. More particularly, the integration of such data with information data systems is a major challenge in most countries.

This stage moves from research about the information system to research using the information system. It is the point of payoff for a country's investment in an information system.

Stage IV: Research using data bases available through the information system

Research studies conducted at this stage go beyond monitoring and evaluating existing programmes. They are conducted to help education planners better understanding the relationships among components of the educational process. Typically, emphasis here is on the use of more sophisticated analytic techniques with a wider set of indicators than may be involved in the evaluation of any particular programme. The questions go beyond immediate application, to examine factors underlying the teaching and learning processes. For example, research studies at this stage might investigate the extent that the amount of pre-service teacher training is related to teachers' subsequent classroom practice, the extent that teachers' classroom practices are related to student achievement, or the extent that family background affects students' school performance. *Chapter 7*, by Kudjoh and Mingat, provides a good example of this use of an information system, particularly the combination of existing national data with that obtained through special data collections.

Stage V: Research on information utilization

As information becomes more available in a ministry, issues will inevitably arise about who has access, under what conditions, and for what uses. The increased availability of information changes the dynamics of a ministry. Those who control information flow gain influence and stature. Information becomes a currency, which can be used to purchase favour and opportunity. Old patterns of communication are strained and informal networks altered as relationships that worked well in a former era are less valued. If information is to be used effectively, thoughtful attention needs to be given to the information architecture within the ministry.

Information architecture refers to the paths and links in the communication network through which information flows. Vertical flow refers to communication between levels; horizontal flow refers to communications among units at the same level of the organization. Ministries in many developing countries are characterized by weak links vertically and very few connections horizontally (see Snyder ; Ju, 1984). Sharing information between units often means transmitting it up the hierarchy to higher authorities who then transmit it down to the intended recipient unit. There is often a reluctance even to share resource materials and publications across units without direction from senior management. The introduction of computer based information systems challenges this pattern, as units have more direct access to information and to communication with other units. The development of information systems, then, requires new attention to paths and patterns of communication. Organizational structure needs to be reviewed in light of new capacities for sharing information, new information to share, and changing rules about how decisions are formulated and publicly justified.

A proposed agenda for training

Improving educational practice requires that decision-makers have access to relevant, accurate, and timely data, the skills necessary to make appropriate use of those data, and the political will to implement the changes indicated. Better information is largely wasted if the other two conditions are not met. The investment in improving an information system needs to include provision for the training necessary to ensure that those leaders with the political will and who have the necessary data also have the skills to make wise use of the information available to them. The direction that such training might take is outlined below.

The training framework presented and illustrated in *Figure 1 in the Appendix, page 257,* is organized around three considerations: (1) the substantive issues to be addressed in the training, (2) the orientation of the training (whether the training is intended to develop skills or broaden participants' perspective), and (3) whether those skills are best taught in short- or long-term training programmes. These three considerations, when considered together, provide a basis for determining the most appropriate target group for the training, the length of the training, and whether the training should be conducted in a field setting or at an established training facility.

Given the nature and scope of the issues and areas covered, the training framework may be of interest to several categories of people. This agenda for training focuses primarily on ministry officials operating at the central and provincial levels although much of what is suggested might also be incorporated in pre- and in-service training courses that are offered to district education officers and headmasters. Seminars and courses outlined here may also become part of programmes for university students in, for instance, social sciences, statistics, economics of education.

Substantive issues to be trained

The substantive issues around which training can be organized form two general groupings – (a) issues in the design and operation of the information system itself, aimed mainly at those personnel who will actually be responsible for setting up and running the technical side of the system, and (b) issues in information use, intended to expand the perspective of decision-makers more than to impart specific technical skills. *Figure 1 in the Appendix, page 257,* helps identify the variety of substantive issues in information use that might appropriately be addressed, ranging from the importance of indicator selection to the formulation of policy alternatives.

Orientation of the training

Orientation refers to whether the training is intended to extend participants' understanding of the uses of education data in planning and programme management or to develop specific skills they need to operate their country's information system. Training aimed at *broadening participants' perspective* is generally targeted at middle- and senior-level decision-makers and tends to be short-term (a few days to a few weeks at a time). The rationale for this type of training is that, quite often, senior officials have little understanding of how national education data can be used to support planning and decision making; they do not see the ways that data can be of use to them or improve their own job performance. When intended users do not know how to interpret and use quantitative data, they tend to ignore them.

As earlier chapters have suggested, even in countries which have reasonably comprehensive data collection, officials may not see the ways they can use the resulting information to actually affect school practice. A first stage of short-term training for this group, then, is to emphasize the sharing of experiences across countries, to widen their thinking and provide concrete illustrations of effective information use. A second stage of short-term training is to help participants develop specific action plans for data use in their country. This stage involves evaluating the good ideas they hear from others in term of relevance and applicability to their own countries. The goal of this second stage is for trainees to identify a clear sequence of steps they need to take if they want to move toward better information use in their own work. They should leave the orientation seminar not just with an enhanced appreciation of the use of data in decision making, but with a clear strategy they can pursue to translate the ideas into action for their own country. Skill development is less important than idea generation, motivation building, and strategy development.

Six key elements should be addressed in an orientation seminar:
(i) *Understanding the problem*: Education ministries in many developing countries operate as steep hierarchies, in which information travels up the chain of command, administrative directives travel down, and little information travels laterally, from unit-to-unit. It is not

unusual, then, to find that while middle-level administrators may understand the particular problems affecting their unit, they lack 'the big picture'. They do not have perspective on the problems facing the education sector as a whole. A first step in training is to introduce that wider perspective.

(ii) *Consideration of alternatives*: Even when policy-makers understand a situation, they frequently do not perceive the options available to them. The interaction with other participants that occurs during orientation sessions can do much to widen a person's vision by suggesting options that they previously have not considered. The credibility attached to the ideas exchanged is often enhanced when those options are grounded in the experience of officials of similar rank from other countries.

(iii) *Analysis of consequences*: Participants should be required to spell out the likely effects of the measures identified and provide estimates of the costs involved to implement the alternatives. The analysis should consider the consequences of not acting as well as those expected to follow from the actions they propose.

(iv) *Identification of information needs*: As part of the three preceding steps, participants will identify types of information they found useful or, alternatively, information they wished they had. This provides an opening to a discussion of information needs, indicator development, and how improving educational indicators can assist planners and decision-makers.

(v) *Data analysis and reporting*: A common assumption is that there are little empirical data about the education system available in developing countries. That is not necessarily true. In many countries, more data are collected than are analyzed or used. The problem in many countries is not a lack of data, but having too much of them. This sometimes leads to a vicious circle. Too much data bog down analysis. Senior officials misinterpret the lack of usable results as an indication that not enough data are being collected, that more would yield the results they seek. This leads to even greater data collection, which only exacerbates the problems of inadequate analysis. An important agenda for training is that participants understand the data management and analysis required to translate the data their ministry collects to the type of information and reports they would find useful.

(vi) *Level of specificity*: What level of accuracy is necessary? Often all that is needed for policy deliberation is an understanding of the direction and the general magnitude of the changes. Arguing over whether the enrolment drop was really 20 or 22 per cent does not change the nature of the intervention that may be needed. Greater accuracy costs time and money. Often the payoff of timely action is greater than the payoff of greater accuracy.

An example, summarized in *Figure 2 in Appendix, pages 258/259*, illustrates how an orientation seminar might be designed. In a three week seminar targeted to central ministry department directors and deputy directors, participants might be given a written description of a fictitious country, including data on key indicators, such as enrolment growth, pupil progression and completion rates, unit and cycle costs, and teacher demand and supply. Though the example is fictitious, the data are selected to describe the general problems faced by many of the countries represented at the seminar. Participants should be able to identify with the scenario.

During the remaining days, participants, working in small groups, are asked to analyze the problems of the country in the case study, anticipate the consequences to the country if the trends are allowed to continue, suggest an alternative strategy for addressing the problems they identified, identify policy options available to the government, and consider the possibility of cross-impacts, in which the proposed solutions lead to problems worse than the one they were trying to solve. The seminar might also include an opportunity for participants to apply insights gained from the case study to their own country's situation. Ideally, this exercise would culminate in participants developing an action plan for how they might initiate a similar exercise when they return home, but using real data from their own country.

It is not assumed in this type of seminar that participants will develop the analytic or organizational skills necessary to conduct a full policy analysis in their own country. It is expected that they will come to see the value such an exercise might have and assign importance to developing the skills involved in doing this type of policy analysis (either in themselves or in others).

Training aimed at *specific skill development* is generally targeted at the staff that will work most directly with the information system and tends to be somewhat longer-term. Meaningful skill development for these staff require extensive knowledge of programme evaluation, measurement, statistics, organizational theory, and information science. Serious training of planners and information systems staff should be conducted through the existing masters and doctoral programmes in information science, policy analysis, and educational administration offered at many universities throughout the world. Once a cadre of well trained staff are in place, short-term training workshops can then be used to introduce new techniques, address specific problems in information system operation, or to share experiences across countries.

There is a growing need for an intermediate type of training targeted to an emerging group of policy analysts who serve in an intermediate role in the ministry – in between actual operation of the information system and formulating policy. They are usually located in a department of planning, policy analysis, or statistics and are responsible for doing an initial interpretation and sorting of the information (1) to identify trends and issues that should be brought to the attention of senior officials and (2) to develop the potential implications and policy alternatives for their consideration. As the amount of information in a ministry increases, these 'information brokers' grow in importance. But they walk a tightrope. They must have the confidence of top officials and be privy to levels of discussion necessary for them to know which issues are deemed most important. This gives them a stature and importance in the ministry that sometimes intrude on their willingness to do the types of routine statistical analysis and report writing that the job requires. Because of their familiarity with the data, these personnel at times have (or think they have) a better idea of what is going on in the education system than the people to whom they report. When their recommendations are not listened to or do not prevail, they can easily become disenchanted. Training for this group is more complicated, since they need both technical skills in data management and analysis and a sound grounding in policy analysis. In general, staff in this role need formal degree level training in a relevant academic area prior to their employment, supplemented, once they are employed, with short-term, issue-oriented training of the type illustrated in *Figure 2 in Appendix, page 258/259*, or training focused on new analytic techniques. Again, this can be a receipt for problems, as staff with this type of background are often better prepared to work at a policy-level than those to whom they report.

Duration of training

Universities and established training programmes (such as at the International Institute for Educational Planning) have a comparative advantage in offering training that requires comprehensive skill development. Two to three week training programmes that claim to teach ministry staff to design and conduct large-scale evaluation studies or conduct policy analysis are mostly wishful thinking. Serious skill development depends on trainees having substantial prerequisite knowledge, systematic instruction on a series of related topics, and an opportunity to practice their new skills within a supervised setting. Conversely, the kind of short-term training illustrated in *Figure 2 (see Appendix, page 258/259)* could, once tested become modules in a university degree programme.

On the other hand, the comparative advantage of short-term, field-based training programmes is the opportunity to reach more senior officials who have limited time for training but whose support and understanding are essential to the successful operation of an information system. These officials generally do not need actual expertise in instrument design, data collection, or analysis procedures. They do need a general appreciation of the problems encountered in each of those activities, ideas about how such problems can be resolved, and a sense of how they can use the information available to them to improve their own performance and the performance of the education system.

An example of this type of training offered by central ministry trainers to regional education staff is provided by recent work in Pakistan (Pakistan Ministry of Education, 1992).

Conclusion

There is an inevitability about the increased importance assigned to data-based planning and management of education. Government officials and educators recognize that efficient information management is a necessary precondition for continued development of the sector. Only as the dimensions of an education system and the problems that beset it are clearly understood can appropriate planning and management of the education system occur. Information is a currency of exchange and increasingly a pre-condition of political and financial support among ministries, among governments, and with international assistance agencies. Even in countries with little history of information collection or use, government officials appear to recognize the importance of straightening their management information systems. The failure to do so has progressively serious consequences as competition for national and international resources heightens (Hallak, 1990; Chapman, 1990).

However, developing a comprehensive data base is only half the battle. While considerable creative thought has been put into the design and operation of management information systems for central ministry planning, considerably less has been given to ways the resulting information can be used to actually improve educational practice at lower levels of the system. The *Issue Papers* and *Country Studies* in this volume represent an attempt to move in this direction.

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Appendix

Figure 1. A proposed Agenda for training

Issues to be addressed in training	Orientation of the training		Duration of the training	
	Develop skills	Broaden perspective	Short term	Long term
Use of information in planning and policy analysis				
Policy analysis		x	x	
Monitoring and evaluation		x	x	
Research		x	x	
Organizational analysis		x	x	
Design and operation of an information system				
Indicator development	x			x
Data collection	x			x
Information management	x			x
Merging data sets	x			x
Data analysis	x			x
Interpreting and reporting				
Quantitative data	x			x

Figure 2. Sample programme for an orientation seminar

Seminar activity	Training materials (inputs) and products (outputs)
Module 1 - Duration: 4 days	
Topic: Identifying status and key problems of education sector presented in fictitious case study	Inputs: Description of selected data for country
Activities: Examination of key input, process, outputs and outcome indicators Comparison of study country with participants' home countries Identification of factors thought to influence educational outputs and outcomes Synthesis of research evidence on the topic	Outputs: Short written analysis by each work group
Module 2 - Duration : 6 days	
Topic: Identification of policy options and appraisal of implications	Inputs: Resource materials outlining implications of various policy options relevant to the case study under consideration
Activities: Inventory of short- and medium-term policy options Assessment of possible impact on quality of each option	Outputs: Discussion notes from work groups

Figure 2 (continued)

Seminar activity	Training materials (inputs) and products (outputs)
Assessment of cost implications	
Appraisal of feasibility • organizational/administrative • orientation and training needs • demands on infrastructure	
Simulation of cost-effectiveness for 2-3 top ranked options	
Module 3 - Duration: 3 days	
Topic: Adoption of policy; strategy for implementation	Inputs: Presentation on incentives and disincentives for information use in planning
Activities: Identification of potential implementation problems	Outputs: Discussion notes from work groups
Strategies for persuasive presentation of proposal for action	
Module 4 - Duration: 3 days	
Topic: Conclusions and preparation of follow-on activities	Inputs: Notes from earlier work sessions
Activities: Large group discussion of work group proposals	Outputs: Written plan for follow-on activities
Formulation of follow-up activities	
Outline of national orientation seminars (assumed to be one follow-on activity)	

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Inquiries about the Institute should be addressed to:
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This book is the product of [illegible] research project conducted by the International Institute for Educational Planning, Paris, and the Improving the Efficiency of Educational Systems (IEES) Project, USA. It provides a synthesis of the lessons [illegible] from a set of experiences and [illegible] in the collection [illegible] quantitative information in decision making [illegible] levels of the educational system in the context of developing countries. [illegible] national case studies have been included (Chile, Haiti, Mauritius and [illegible]) [illegible] particular emphasis on the [illegible] and [illegible] incentives that operate to encourage and sustain the use of information in the [illegible]. In addition, [illegible] have been included [illegible] that [illegible] education information systems can contribute to [illegible] and [illegible] of education.

The [illegible] to the book [illegible] not the [illegible] the continued development of information systems and to [illegible] systems [illegible] decision makers. Such training should not only be of interest to national officials operating at different levels but also to university students in [illegible] the [illegible] and management of information systems.

David W. Chapman is Professor of Education at the State University of New York at Albany where he teaches programme evaluation in the Department of Educational Theory and Practice. He is co-author (with Douglas M. Windham) of *The evaluation of educational efficiency: [illegible]* and co-editor (with Herbert Walberg) of *International perspectives on educational productivity* and *[illegible] quality: a research perspective* (with Carol Carrier). His [illegible] educational improvement has appeared in many research journals. In addition to his research and work on educational improvement in the USA he has worked on technical assistance activities in over 15 developing countries.

Lars O. Mählck is a staff member of the International Institute for Educational Planning in Paris and has been associated with the Institute's research project on *The information base in educational planning and administration*. He directed the research projects on *Educational policy [illegible]* and *The [illegible]*. He is co-editor (with Kenneth N. Ross) of *Planning the quality of education*. He co-directed the project on *Improving the [illegible] information systems* on which this volume is based. In addition to his research activities at the IIEP he serves as lecturer to participants in the IIEP Annual Training Programme and has directed several of the Institute's training courses and seminars in Africa and Latin America.

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